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FEMININE VOLUBILITY.

BY THOMAS FOSTER.

AMONG the minor miseries of life, which become by frequent repetition, and by steady continuance, very serious troubles, perhaps the querulous volubility of kindly women, is as apt as any to embitter life. The scolding vixen is endurable by comparison with the unselfish woman, whose anxiety for the welfare of those around her leads her to make them all exceedingly uncomfortable. I can imagine a man of sense exposed to the angry vituperations of a Xantippe, finding in them after awhile a fund of amusement. I cannot imagine such a man becoming very angry with a mere shrew, save perhaps for the effect of her vile temper on the comfort and happiness of others. But it is different with the complaints of those whom we know to be well-meaning. Their querulousness is infinitely more trying, because we cannot separate from our sense of annoyance the sense of utter incongruity between the object they really have in view and the effect they as a matter of fact produce.

A vixen's anger may be compared to a storm which interests more than it annoys; the complaints of kindly but over-anxious women resemble the steady downpour of rain, the purpose of which is excellent, but the effect while it lasts most wearisome and annoying. One cannot get angry with rain or drizzle, but one can get no comfort out of it; whereas one can enjoy the sense of opposition roused by a fierce storm through which one may have to make a way.

I recall here, by the way, that George Eliot, who noted more closely than most persons the sources of domestic happiness and misery, has dwelt on this difference between the mere vixen whom everyone contemns and the Mrs. Gummidges who trouble those around them by constant complaints which have their origin in over-anxious love. "Women who are never bitter and resentful," she says, "are often the most querulous; and if Solomon was as wise as he was reputed to be, I feel sure that when he compared a contentious woman to a continual dropping on a very rainy day, he had not a vixen in his eye—a fury with long nails, acrid and selfish. Depend upon it, he meant a good creature, who had no joy but in the happiness of the loved ones whom she contributed to make uncomfortable—putting by all the tit-bits for them, and spending nothing on herself—a woman at once patient and complaining, self-renouncing and exacting, brooding the livelong day over what happened yesterday, and what is likely to happen to-morrow, and crying very readily both at the good and the evil."

How many families know this kind of good woman, and the misery her voluble manifestations of anxiety occasion to every one within range of her voice. She is generally possessed with the notion that much more depends on her than is actually the case. But one feels that it would be unkind to tell her so. Her volubility about her multitudinous cares and anxieties produces a distressed silence among those around. The thought of all—that matters would go well enough if she could but leave them a little alone—is expressed by none. Wearily she laments what is past and cannot be altered, or proclaims anxieties about what may never happen. Over and over again, in ever-varying forms, the same imagined troubles or long-past misfortunes are lamented over with wearisome iteration,—and the patient hearers, among whom may be those who have the real work of keeping things straight, can never find courage to ask for some remission of their misery. She gets at last, the idea that the ceaseless worry which deprives all around of half the comfort of life, is all that preserves the family from rack and ruin. "Your father has all his worry abroad," one of these unhappy ones will say, "I have to bear all the worry at home," where—if she knew the real truth she would say, "My husband's work and worry abroad is made for him by others; I make all the worry at home, or most of it,—for him when he comes home tired with his day's work, and still more for the unfortunate folks who are at home through the day."

I sometimes wonder whether in homes made miserable by constant worries of the kind I am dealing with, the kinder way would not be to speak plainly, even at the risk of causing some little pain, or even at first somewhat sharp and bitter pain. At the outset, were not fathers and husbands too apt to be unduly indulgent, the querulous humour might, I believe, be easily checked. I know that most men put up with it as a feminine weakness which should be indulged; they even deem it a part of manly duty to be patient under the infliction. If no one suffered but the husband or the father, there might be little harm in this mistaken view of duty. But the case is otherwise. Many suffer besides him. Amongst others none suffers in the long run more than the offender herself. She may not consciously recognise how wrong her conduct is, or how much misery it causes; but it does make her unhappy both directly and indirectly, directly as her growing querulousness shows, indirectly because she cannot but feel that those whom she wishes to see happy are uncomfortable if not miserable while she mourns and laments on their behalf. For want of a few words of good advice, or even, if necessary, of very definite warning and *command*, many a well-meaning woman has made her own life and the lives of those dear to her, a long spell of discomfort where they might have been most happy, and has ended by alienating the heart of the man who had not the heart to check at the right time, her querulous ways. There is more true love in kindly severity of rebuke before the mischief is done, than in

more patience to bear the misery—patience which after all may be at last overworn, or remaining, may become the patience of disgust instead of the patience of love.

GROWTH OF A FAMILY.

BY RICHARD A. PROCTOR.

MR. FRANCIS GALTON has expressed a wish to obtain from heads of families statistics about the development of children in height, weight, &c., at various ages. But I imagine he will not get a very large supply of accurate statistics, and that without much fuller information than the average British paterfamilias is likely to supply, the statistics will not be much more valuable than those stupendous collections of meteorological records which thus far have proved such utterly useless loads on official shelves. For statistics are "kittle cattle to shoe behind": properly employed they may lead us to truth, but unless well treated they are apt to project us on the road to error.

Still there can be no doubt that carefully collected and compiled statistics about the development of children would be interesting and valuable. The mere records of the heights of children at different ages, for example, may possess high physiological interest, especially if accompanied by information as to circumstances which may have affected growth.

I have not myself been very attentive to such matters, although so far as numerical relations are concerned I have had as good opportunities as most men. Since 1866 (when the Corner House fell, and by its fall condemned many innocent persons to hard labour for life), I have not been so constantly with my family as Mr. Galton's statisticians are expected to be. Many times I have been away from home for seven or eight months at a stretch; and once I was away nearly two years. And indeed, it has been merely in a casual way that I have taken measurements, usually when by some lucky chance my whole family were gathered together and the question of growth chanced to be started.

I was surprised, therefore, to find that the records I had scrawled on the margin of a certain page, gave so much information as, when analysed, they appear to me to convey. That page is the one in Lardner's "Common Things Explained," in which Quetelet's curve of growth is given. I used to compare the heights of my children with those due to their several ages according to Quetelet's mean curve; and so I naturally pencilled in my notes alongside that curve of comparison.

A short time since I made a clean copy of these pencilled notes. In the course of the work it struck me that a series of curves for comparison with Quetelet's would be interesting. The smaller figure in the accompanying engraving arose out of this idea. It will be seen that the heights for the five children dealt with are shown in curves set down on the same plan as Quetelet's growth curve, so that one can see at a glance whether the height of a child at any age was above or below the average height for that age. (Quetelet's curve corresponds to a height, when full grown, of rather more than 5 ft. 6½ in.)

But I first set out the heights of the different children dealt with (I omit the records of several of my children who died young) as they were recorded on given dates, obtaining the very curious series of curves occupying the larger-scale portion of the drawing.

When I had completed these figures they seemed to me suitable as rough examples of the kind of information we may expect to obtain from family height-records such as Mr. Galton has suggested. Of course, had my records been made in pursuance of a definite plan they would have been better worth publishing.

The figures need little explanation. The progress of time is supposed to take place from left to right, one division to each year in each figure, but the time divisions in the smaller figure are only one-fourth those in the larger. Height is represented vertically, as is natural, one space to three inches in each figure, but the height spaces in the smaller are only one-third those in the larger.

The heights were obtained in a systematic manner. They are the heights in "stocking-feet" (to use an absurd expression), and although I had no regular measuring staff, I secured accuracy by using always a square-edge, slid down a vertical surface until it just touched the head. (Putting a flat surface on the head is a very inaccurate method, as it is not easy to determine when it is level, but with any square surface set with its plane vertical, and one edge against a vertical wall, you can get all the accuracy of a regular height measurer.

The records from which the drawings were made are as follows:—

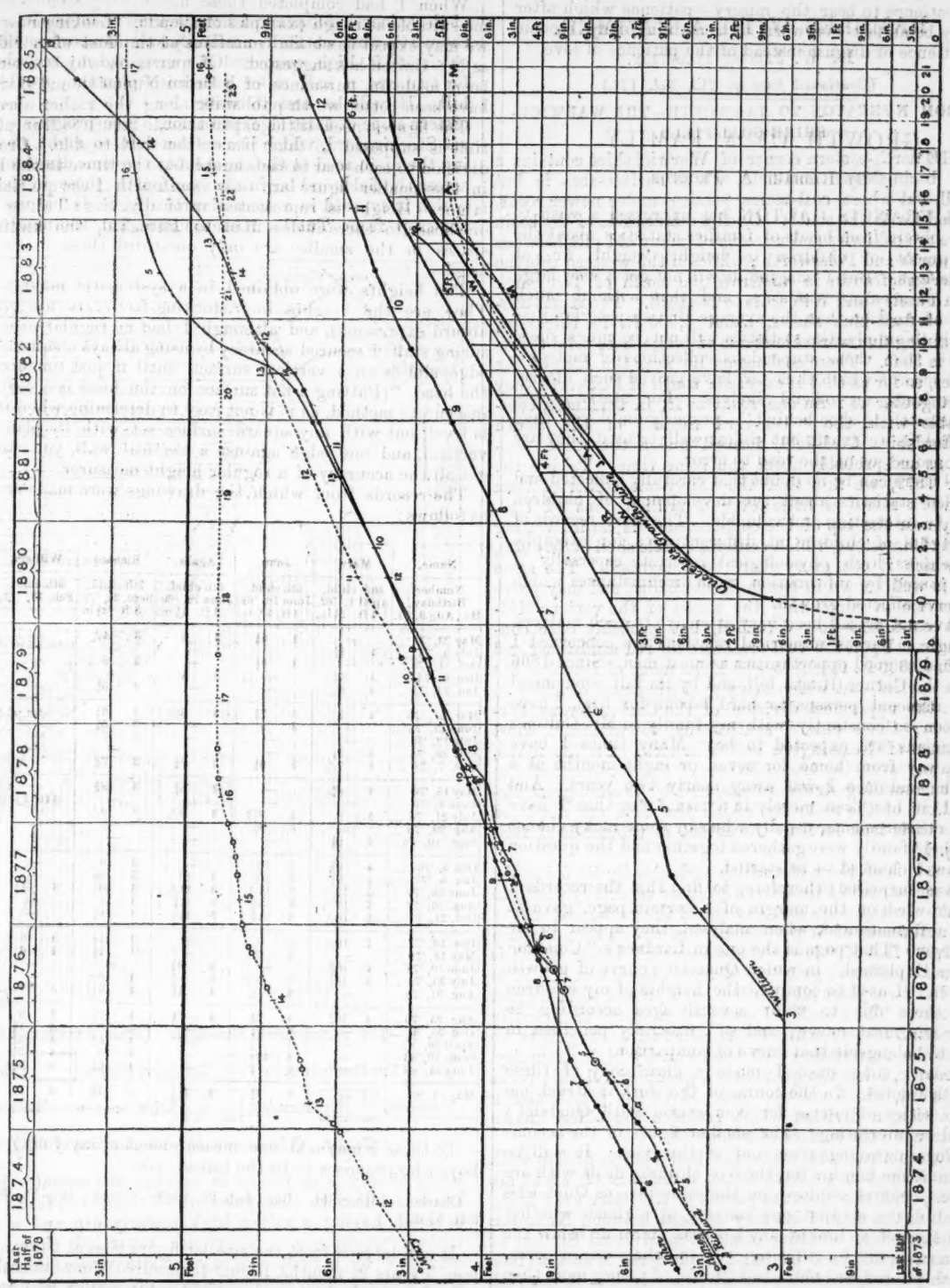
Name.	Mary.	John.	Agnes.	Richard.	William.
Number.	2nd child.	5th child.	6th child.	7th child.	8th child.
Birthday.	April 1, '62.	June 18, '68.	June 18, '69.	Sept. 26, '70.	Feb. 13, '73.
Ht., Aug. 9, '73.	4 ft. 2½ in.	3 ft. 4 1/16 in.	3 ft. 2½ in.	3 ft. 2½ in.	—
May 23, '74	—	3 5½	3 4	3 4 5/16	—
July 5, '74	4 4½	—	—	—	—
Oct. 11, '74	—	3 8½	—	3 5	—
Dec. 9, '74	4 5½	—	3 4 1/16	—	—
Jan. 24, '75	4 6 3/16	—	—	3 5½	—
Mar. 27, '75	4 7	3 7½	3 5 1/16	3 6½	—
June 13, '75	—	3 8	—	3 6½	—
July 13, '75	—	—	—	3 7	—
July 29, '75	4 7½	—	—	—	—
Sept. 7, '75	4 7 7/16	3 8½	3 7½	3 7½	—
May 15, '76	4 8½	—	3 8½	3 8½	—
June 5, '76	—	—	—	—	3 ft. 1 in.
July 21, '76	4 9	3 9 1/16	3 9 3/16	3 9 3/16	—
Aug. 29, '76	—	3 9½	—	—	—
Sept. 10, '76	4 9½	—	—	—	—
Oct. 5, '76	4 9½	3 10	—	3 10	—
Jan. 5, '77	4 9½	3 10½	3 10	3 10½	—
June 26, '77	4 10	3 11 5/16	3 11 1/16	3 10½	3 4½
Aug. 16, '77	4 10	3 11½	3 11½	3 11	—
Oct. 21, '77	4 10 3/16	3 11½	3 11½	3 11½	—
Dec. 16, '77	4 10 3/16	4 0	—	3 11½	3 5
May 15, '78	—	4 0½	—	3 11½	3 6
June 10, '78	4 10½	—	4 0½	—	—
July 23, '78	4 10½	4 0 13/16	4 0 13/16	4 0 13/16	—
Aug. 31, '78	—	4 1½	4 1½	4 0 15/16	3 7
Aug. 25, '79	4 10½	4 2½	4 2½	4 2½	3 9
Dec. 25, '81	—	4 7½	—	4 7	4 1½
April 18, '82	—	4 7½	—	4 7½	4 2½
Sept. 19, '82	—	4 10½	—	4 9	4 3½
June 24, '83	—	5 1½	—	4 10½	4 4½
May 13, '85	—	5 2½	4 11½	5 4½	4 7½

To these I may add one measurement of my youngest boy, who promises to be the tallest, viz.:—

Charles. 13th child. Born Feb. 28, 1882. Height, May 13, '85, 3 ft. 3½ in.

It will be seen from the smaller figure that at the same age, 3 years 2½ months, Richard measured almost exactly 3 ft. 3 in. (If I remember rightly my eldest son was taller than my youngest at the same age.)

But the most remarkable departure I have noticed from the average curve, and as I take it from normal growth, is in the case of one of my step-daughters who, when aged 9 years 7 months, on May 13, 1885, measured



4 ft. 4¼ in., a great height, as the average curve shows, for a girl of that age.

I doubt by the way whether Quetelet's curve has the right shape. For it cannot be regarded as a mere accident that all the curves in the smaller figure show a depression compared with the average curve, between the ages of 7 and 12.

I have some records of weight, but they are not trustworthy, as they were taken at different hours of the day, and no account is taken of the weight of clothes.

RAMBLES WITH A HAMMER.

BY W. JEROME HARRISON.

(*Continued from p. 215, Vol. VII.*)

FROM NUNEATON TO TAMWORTH—THE WARWICKSHIRE COAL-FIELD.

THE north-eastern corner of Warwickshire contains a basin-shaped coal-field, whose surface-area is but small, but whose coal-seams, passing under newer rocks, extend far to the south. On the eastern side of the basin there are collieries and remains of many old pits between Bedworth and Polesworth; while on the western side the colliery shafts run in a narrow line south of Tamworth from Fazeley and Wilnecote to Dosthill. The strata consist of dark-blue shales, about 1,500 ft. in thickness, containing five workable seams of coal, whose total thickness is 30 ft. These coal-seams lie near the base of the shales, so far as that is exposed; south of Bedworth they run together to form one seam 26 ft. in thickness, comparable with the "Ten-yard Seam" of the South Staffordshire Coal-field, formed under the same conditions and probably about the same time. Taking the year 1879, we find that the thirty-one collieries then at work raised a little over a million tons of coal. Very near the top of the coal-measures is an interesting band of limestone, which contains a little shell (a *Serpula*), by which it can everywhere be recognised. The same bed is well known in North Staffordshire, and may prove of service in correlating the strata of the various Midland coal-fields—now detached, but probably once continuous. Upon the coal-measures lie red sandstones and marls (2,000 ft. thick) to which the name of *Permian* has been applied, but which many geologists now consider to form the uppermost division of the Carboniferous Formation; these extend southwards to within a short distance of Leamington and Warwick. On the north, east, and west, the true relations of the coal-measures to the surrounding strata are obscured by *faults*—great dislocations of the rocks by which the beds are displaced from their true level to the extent of thousands of feet. (Fig. 1.)

But it is of the rocks which undoubtedly lie *below* the coal-measures in this district that we especially desire to treat. In the maps and sections of the geological survey the coal-seams of Warwickshire are shown as underlain by 2,000 feet of "lower coal-measures," below which is shown "millstone grit" 1,000 feet in thickness. Within the last two years all this has been proved to be a great mistake. The so-called lower coal-measures are actually *Cambrian shales*; while the so-called millstone grit turns out to be a quartzite of at least equally high antiquity. Moreover, *below* the quartzite, a group of volcanic rocks peeps out, which must be assigned to the pre-Cambrian formation, a division which includes the oldest known strata upon the surface of the world.

To see these old rocks, the best plan is first to walk from Nuneaton to Atherstone, a distance of about six miles; or, if time does not permit of the latter town being reached, the main facts may be seen between Nuneaton and Hartshill. Getting out at the Midland Station at Nuneaton, the rock behind the platform is seen to be a much-jointed, reddish quartzite, exactly like that which forms the Lower Lickey Hills, in Worcestershire, and which also crops out round the Wrekin, in Shropshire. Crossing the line, there is a fine section exposed in a quarry close to the canal. Here the quartzite is traversed by an intrusive rock, which Mr. Allport has shown to be a *diorite*, composed of the minerals felspar and hornblende. Looking now to the north-west we find ourselves at the foot of a ridge about 500 ft. high, composed of quartzite, which extends for two and a half miles between Nuneaton and Hartshill. It will be best to walk along the rather abrupt eastern slope of this ridge, and then to return to Nuneaton *vid* Stockingford, which lies on the western side. Crossing the main road at the canal bridge we turn to the left across the fields and begin an examination of the quartzite, which is exposed in a succession of quarries all along its out-crop from Tuttle Hill to Hartshill, the sections

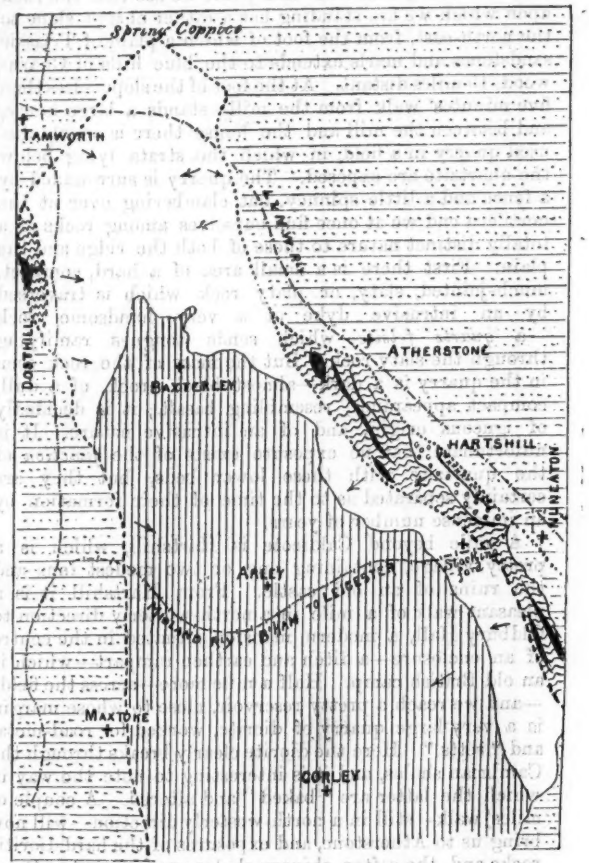


Fig. 1.—The Warwickshire Coal-field. (Scale, 3 miles to 1 in.)

Pre-Cambrians. Cambrian Shales. Coal-Measures. Permian. Trias. Railways. Faults. (The arrows show the direction of dip.)

being simply magnificent in number and extent. In a brick-pit close to this point, the Triassic red marls are exposed, having a rather high easterly dip and a disturbed appearance. They are separated from the quartzite by a fault. The quartzite varies in colour from white to red, and contains many specks of decomposed felspar. At its base it is full of angular fragments of felstone and slate, derived from the rocks beneath. Estimating the thickness of the quartzite at 1,000 ft., we find that bands of shale appear about the middle, and as we approach the top these shaly beds become thicker and more numerous. No fossils have yet been found in

the quartzite—not even a worm-burrow—but as it is clearly a sandstone which has been consolidated by the deposition of silica (from heated waters which formerly traversed the rocks) it is possible that fossils may yet be found. It is extensively quarried for road-metal. The prevailing pink tinge of the stone seems to be due to the presence of a little manganese. This quartzite dips to the south-west at angles of from 25 to 45 degrees.

To see the very old—probably pre-Cambrian—rocks which lie *beneath* the quartzite, we must walk along the ridge, which attains a height of 500 feet, to Caldicote Mill. Looking east from this point we see that the rock upon which we are standing has a rather abrupt slope to the north-east, from the foot of which a plain of Triassic sandstones and marls extends to the blue hills of Charnwood, 15 miles distant. At the foot of the slope—less than five minutes' walk from the mill—stands a large house, and between the mill and the house there is an old disused quarry in a field, in which the strata lying below the quartzite are exposed. The quarry is surrounded by a fence and a little spinney, but clambering over at the northern end we at once find ourselves among rocks of a totally distinct nature to those of both the ridge and the plain. First there is a small area of a hard, compact, much-jointed, slaty, or platy rock which is traversed by an intrusive dyke of a very handsome rock—a *quartz felsite*—which sends tongues ramifying through the slaty rock. But the mass of the rock seen in the quarry is a dark—almost black—rock, of a dull, compact appearance, resembling basalt; it is decidedly of igneous origin, and of an intrusive nature. It is unfortunate that no exposure exists of the *junction* of the quartzite with these lower beds, but they are certainly separated as to the time of their formation by an immense number of years.

A mile beyond Caldicote is Hartshill, which is a pretty village, containing one or two modest inns and the ruins of an old castle. From Hartshill it is a pleasant walk of a mile in a north-westerly direction to Oldbury Hall, a modern mansion situated in the centre of an enclosure—a ditch and earthen rampart—which is an old British camp. Half a mile more—across the fields—and we reach a pretty reservoir, close to whose margin is a very large quarry of diorite, worked for road-metal and "setts." Here the diorite clearly breaks through the Cambrian shales, and it is interesting to note the way in which the latter are "baked" and altered. A couple of miles' walk—still in a north-westerly direction—will now bring us to Atherstone, and exposures of the hard dioritic rocks and the softer, shivery shales are frequent. Deep, narrow ravines have been excavated by rain and frost in the shaly beds, while the igneous rocks—the diorites—form round-topped ridges between.

(To be continued.)

THE PHILOSOPHY OF CLOTHING.

By W. Mattieu Williams.

XII.—THE ADVANTAGES OF WOOLLEN CLOTHING.

THE practical conclusion that obviously and directly follows from both series of Rumford's experiments—viz., those on the comparative resistance of the various materials to the passage of heat, and those on their absorption of aqueous vapour—is that a loosely-woven woollen fabric is the best material for clothing, both in winter and summer. Flannel is such a fabric, and its merits are now demonstrated by the unanimous verdict of all who have severely tested it; by athletes, by furnace workers, by sailors, by soldiers, by navvies, &c., especially those who are exposed to extreme fluctuations of heat and cold under the most trying circumstances of profuse perspiration due to violent muscular exertion. A man wearing a superfine black Saxony close-fitting dress suit outside, with a fine linen shirt next to his skin, may be killed by an amount of exposure that he could bear with impunity in loose-flannel "whites."

We understand this now, but it was very different in Rumford's time. He says, "I am astonished that the custom of wearing flannel next the skin should not have prevailed more universally. I am confident it would prevent a multitude of diseases; and I know of no greater luxury than the comfortable sensation which arises from wearing it, especially after one is a little accustomed to it."

More or less irritation of the skin is usually suffered on first wearing flannel; in some cases it continues and is quite serious. Besides this, flannel shirts of good quality, made of pure wool, without admixture of cotton, shrink very vexatiously when washed in the ordinary manner, *i.e.*, when soaped and scrubbed in hot water. Such shirts should be washed in cold water. When I lived in Scotland I was not annoyed by this continuous shrinking of soft flannel shirts, neither by the shirts I wore in Norway, and which I washed daily in mountain streams at my mid-day bathing time, and dried by hanging them to my knapsack. In this country, where we are dependent on laundresses, and may not hang them for boiling flannel shirts, this shrinkage difficulty is rather serious, as it appears to have no practical limit where the boiling propensity prevails.

Writhing under this annoyance, about a dozen years ago I made an experiment which was fairly successful, but atrociously heterodox, and was persecuted accordingly.

I had half a dozen shirts made of "towelling;" that fabric of which old-fashioned towels are made, which is dotted all over with a warty appearance, due to the extreme looseness of the weaving of a portion. These spongy warts project above the general surface, thereby keeping it from continuous contact with the skin, and by virtue of their loose structure they readily absorb the perspiration, as they do the water when the material is used as a towel. My theory was that the fabric, which experience had proved to possess the absorbent properties demanded by a towel, would be well fitted for absorbing the sensible perspiration from the skin. They did this admirably, better than flannel, though I doubt whether they equalled flannel in diffusing the insensible or gaseous perspiration. A certain amount of moral courage was exercised in taking off my coat in the presence of spectators, and the fronts of these shirts were not quite correct for the evening dress of the period.

We are making good progress, however, towards dethroning the despot, Fashion. Country gentlemen are nearly liberated; cravats have gone, the stove-pipe hat is going, and I look forward hopefully to the time when bank clerks, the peculiar people of the Stock Exchange, and other commercial and professional respectables will go to the City in their flannel whites as they now go to cricket and lawn-tennis. When they do so, their employers will discover that the conditions which are favourable to muscular energy in athletic sports are also demanded for the maintenance of that maximum of cerebral activity upon which eminent efficiency in business and professional work depends.

Rumford, when residing in Paris, carried out his principles by wearing white and loose-textured woollen clothing, which, from the sneering descriptions of his French biographers, appear to have been almost identical with the now common Saturday costume at Oxford and Cambridge, and everywhere else in Britain where healthy and sensible young men are free to shake off the fetters of conventional foolery. Rumford was cruelly persecuted by the dandies and salonmongers of Paris, and even by the scientific men of the period, who displayed their superior taste by wearing tight breeches, whaleboned stays, and monstrous super-starched bandages strapped round their necks in such a manner as to render the natural movements of the head impossible.

Referring to his experience, Rumford says, "It is a mistaken notion that it (flannel) is too warm a clothing for the summer. I have worn it in the hottest climates, and at all seasons of the year. I never found the least inconvenience from it. It is the warm bath of a perspiration confined by a linen shirt, wet with sweat, which renders the summer heats of the tropical climates so insupportable; but flannel promotes perspiration, and favours its evaporation; and evaporation, as is well known, produces positive cold." He adds, "I first began to wear flannel, not from any knowledge I had of its properties, but merely upon the recommendation of an eminent physician (Sir Richard Jebb), and when I began the experiments of which I here give an account, I little thought of discovering the physical cause of the good effects which I had experienced from it; nor had I the most distant idea of mentioning the circumstance. I shall be happy, however, if what I have said or done upon the subject shall induce others to make a trial of what I have so long experienced with the greatest advantage, and which, I am confident, they will find to contribute greatly to health, and consequently to all the other comforts and enjoyments of life. I shall then think these experiments, trifling as they may appear, by far the most fortunate and the most important ones I have ever made."

It should be remembered that this, and the account of the experiments, are included in a paper read before the Royal Society, March 22, 1787.

Further practical data have since been accumulated, confirming all that Rumford said in favour of flannel. The most valuable are those obtained by comparing the results of wearing different kinds of clothing upon the general health of large bodies of men whose occupations and other conditions of existence are sufficiently similar to admit of fair comparison.

Experiments of this kind made on soldiers and sailors have resulted in an unanimous verdict in favour of flannel. A striking example is quoted by Dr. Andrew Combe, on the testimony of Captain Murray, of H.M.S. *Valorous*, who, on his arrival in England in December, 1823, after two years' service amid the icebergs on the coast of Labrador, was ordered to sail immediately, with the same ship and crew, to the West Indies. Acting on the convictions derived from previous experience, he directed the purser to draw two extra flannel shirts and pairs of drawers for each man, and instituted a regular daily inspection to see that they were worn. He proceeded to his station with a crew of 150 men; visited almost every island in the West Indies, and many of the ports in the Gulf of Mexico; and, notwithstanding the sudden and extreme transition of climate, returned to England without the loss of a single man or having any sick on board when he arrived. When in command of the *Recruit*, gun brig, which lay about nine weeks at Vera Cruz, the same measures preserved the health of his crew when the other ships of war, anchored around him, lost from twenty to fifty men each. Other sanitary measures were enforced, and, of course, contributed to these results; but the most heretical departure from the naval usages *then* prevailing was this enforced wearing of flannel in a hot climate.

Sir George Ballingall (Lectures on Military Surgery) mentions that when in India, at a time when this subject was but little understood, he witnessed a striking proof of the utility of flannel in checking the progress of a most aggravated form of dysentery in the second battalion of the Royals. I understand that such experience has now led to a general enforcement of the use of flannel belts or wraps by our soldiers when on service in tropical climates. My friend Mr. Sage, of the Army Clothing Depôt, at Pimlico, tells me many thousands have lately been made there.

This demand for abdominal belts or sashes in hot climates is rather curious and somewhat anomalous, but is, nevertheless, well founded. My attention was first directed to it at Constantinople, where I resided during the hottest months of the hot summer of 1843. An intelligent Greek, who had lived there more than thirty years, advised me to adopt an Oriental sash. He had suffered severely at first, other Greeks the same, and all had escaped further attacks of summer dysentery on following the general custom of winding some kind of bandage round the loins. I followed his advice to the extent of wearing a single bandage of flannel next the skin, and from this experience and subsequent observations have concluded that the extravagantly long and cumbrous Oriental sash, wound six or eight, or even a dozen times round on the outside of other clothing, although advantageous in preventing the sudden chills from the evaporation of accumulated perspiration, may be very advantageously substituted by a single envelope of loosely woven flannel, or, better still, of knitted fleecy wool fabric, worn next to the skin. It should be sufficiently elastic to keep in its place without straps.

Its advantages over the extravagant outside sash depend upon the steady and regular absorption and transpiration of the perspiration vapour demonstrated by Rumford's experiments. The ordinary sash acts by absorbing the liquid sweat as a sponge absorbs water. The wearer of the manifold sash becomes a slave to it in consequence of its inducing a delicate and sensitive condition of the over-swaddled skin.

The naked natives of tropical countries do not appear to be troubled with the dysentery which the sash or belt of their clothed neighbours prevents. I suspect that the reason of this is that the mischief is done by a thin covering of cotton or linen clothing becoming wetted by the perspiration, and then cooled by rapid evaporation in a current of air.

The relation of flannel to the secretions from human oil glands will be discussed presently.

THE Society of Arts Conversazione at the Inventions Exhibition on Friday last was a great success, to which the fineness of the weather contributed in no small degree. It was very apparent that no effort had been spared to make the evening an enjoyable one.

THE sixpenny telegram scheme has again been relegated to the official pigeon-hole, although there is just a chance that the outcry against its present abandonment may result in its being re-introduced into Parliament during the present session. In order to meet the anticipated increase in traffic, upwards of half-a-million has already been spent in increasing the wire and instrument accommodation, and the number of clerks has been increased by 1,200.

TRICYCLES IN 1885.

By JOHN BROWNING.

(*Chairman of the London Tricycle Club.*)

A NEW MACHINE—THE COVENTRY CHAIR.

SMALL WHEELS *VERSUS* LARGE.

ANOTHER new tricycle has just been invented, patented, and brought forward by Mr. A. C. Phillpott.

The inventor has kindly placed the first experimental machine made at my disposal, and, having had it for nearly a week, I have been able to form a tolerably good opinion of its merits. Its great peculiarity is that it combines bicycle-steering—that is, a cross-bar with two handles in front of the rider—with rear-steering.

Bicycle-steering I consider the most efficient of all steering, because it is simple and direct, and there is no rack or pinion to get out of order. Twice I have been within a shaving of a bad accident owing to my steering having been suddenly stopped, caused by mud having got in between the teeth of the rack and hardened, and thus jammed my steering.

Of course, rear-steering is not of itself an advantage, but a rear-steerer can probably be made lighter than a front-steerer; and it can certainly be driven up hill easier. The experimental machine I tried weighed only about 36 lb., and I should think a very light roadster with an efficient break could be made not to weigh more than 50 lb. I found in the model, as it may be termed, of which none of the parts were adjustible, that the pedals were rather beyond my reach, and were some inches too far in front of me, so that I had to work with a thrust, instead of the vertical action I am used to; and the handle-bar was about three inches too low, coming in contact with my thighs.

Yet, with all these disadvantages, the machine behaved fairly well. The steering was better than that of any other rear-steerer I have tried, excepting, possibly, the Rover; and it should be recollected that the Phillpott machine has the advantage of bicycle-steering. I tested the steering as severely as I could, because this was the only point on which I was doubtful of its performance. In the course of my ride I put first one of the driving-wheels, and then the hind steering-wheel over a stone of at least three inches diameter, when running down hill, without causing the machine to swerve at all dangerously.

The steering is very peculiar, being arranged so that a steering-wheel of any size may be employed. For a roadster this hind steering-wheel might with great advantage be 22 inches diameter.

Hirst, of Croydon, is remodelling the machine, and I hope soon to hear that it is being manufactured for sale.

The tricycle I have just described was, of course, planned for speed only. Turning to another class of machines—those intended for carrying weights—I note that a really wonderful performance was achieved last week on one of Starley & Sutton's Coventry Chairs.

The rider of this machine left Coventry on the evening of June 19 at 6.30, carrying a lady in the invalid-chair strictly as a passenger, and fifty pounds of luggage. Daventry, a distance of twenty miles, was reached a little before 9.30—that is, in less than three hours. After some refreshment and a rest, a fresh start was made at 11 o'clock.

At 1.10 a.m. the rider and driver had reached the clock-tower at Towcester. Here rain began falling, and showers kept coming down throughout the rest of the ride, making the roads very heavy. The passenger, wrapped in waterproofs and carrying an umbrella, went to sleep, and allowed the umbrella to rest on the wheels, so that the driver had to wake her. Some time after this, when the rain ceased for awhile, the umbrella was dispensed with, and the lady in this interval slept undisturbed. This fact shows the easy motion of the Chair.

After passing Fenny-Stratford the driver encountered several miles of stiff, heavy ground of almost continuous hills. Dunstable was reached at 6.57 a.m., the pace having averaged six miles an hour all the way. At 9.30 a.m. the driver and passenger again started to run the last thirty miles into London.

The Finchley Post-office, 88 miles from Coventry, was reached at 3.15 p.m., and a telegram was despatched from there to Coventry. The driver then rode easily on to Euston-square, which was reached at 4.50 p.m., thus accomplishing a run of 95 miles in about 22 hours, including all stoppages.

The Coventry Chair would be invaluable at small railway stations for the conveyance of light luggage or a single passenger, and anyone having an invalid or crippled friend or relative would find one a boon beyond price.

A road ride has recently taken place between the rider of a tricycle and the rider of a bicycle.

Mr. Simmons, one of the best riders of the Waverley Bicycle Club, rode a light bicycle with a 57-in. wheel.

Mr. A. J. Wilson rode a regular roadster, Quadrant, made by Lloyd Bros. This machine had 40-in. driving wheels geared up to 60-in., and a steering-wheel 26 in. diameter.

The rider of the small-wheeled tricycle won easily, under this great disadvantage, that the road chosen being an exceptionally rough one, he could seldom find good surface for all three wheels, while the rider of the bicycle generally found a fairly good surface for two wheels in line, which requires good surface only for one.

The distance ridden was 22 miles, which was accomplished in 1 hour 37 minutes.

About two years since several riders wrote to KNOWLEDGE, ridiculing my notion that a tricycle with 40-in. wheels could be faster than one with 48-in. wheels; yet here we have a machine with two 40-in. driving-wheels beating a machine with one driving-wheel of 57 in. diameter.

Messrs. Lloyd have been the earliest after Humber & Co. to adopt small wheels. I notice more of their machines on the great South-road every month, and all their riders I have spoken to have been pleased with them.

Again, in describing the exhibits at the Stanley Show, I said that Starley & Sutton's Rover Safety Bicycle would prove to be the safest, and probably the fastest, machine of the kind among the great number exhibited.

I selected it for two reasons: Firstly, because the hind wheel was nearly as large as the front wheel; and secondly, because the rider was placed nearly midway between the two wheels.

Many experienced riders now find that it is nearly, if not quite, as fast as an ordinary bicycle on a level road, and faster uphill. It is, therefore, undoubtedly faster than an ordinary bicycle on an undulating road, and, on the score of safety, it leaves nothing to be desired.

THE excursions of the Geologists' Association during July will be:—Saturday, 11th, Aldershot and Wellington College, leaving Waterloo at 10.15; Saturday, 18th, Ascot, Bracknell, and Wokingham, leaving Waterloo at 11; Saturday, 25th, Bedford, leaving St. Pancras at 11.10.

CHATS ON GEOMETRICAL MEASUREMENT.

BY RICHARD A. PROCTOR.

THE SPHERE.

I.—SURFACE.

A. Of course we cannot deal with the sphere in the same way, seeing that it has no flat surface at all.

M. That is not the difficulty; for a hemisphere has a flat surface; and if you could deal with the hemisphere, you could deal equally well with the sphere.

A. The sphere seems likely to be difficult to deal with. In fact, I remember now that the discovery of the relation in volume between the sphere and the cylinder was considered so great a triumph of the geometrical skill of Archimedes, that it was especially commemorated on that great geometer's tomb.

M. Yes; but for all that there is no particular difficulty in the geometrical solution of this problem, once we have mastered the simple principle for the treatment of geometrical limits, already explained in this series of papers.

A. I cannot see how to set about it; there seems no place to begin from, whether we are considering the surface or the volume of the sphere.

M. Or in other words, you may begin *anywhere*.

A. Anywhere seems to me like nowhere in this case.

M. We will give the sphere a diameter, and start from that.

A. I suppose we begin with the surface?

M. We do. Suppose B A D, Fig. 1, a hemisphere; C, its centre; C A the radius perpendicular to the semicircle B C D, whose plane being turned edgewise appears as a straight line. Now observe that our proceedings are supposed to be tentative. I ask you, therefore,—what seems to you a natural way of trying to find the area of the hemisphere B A D?

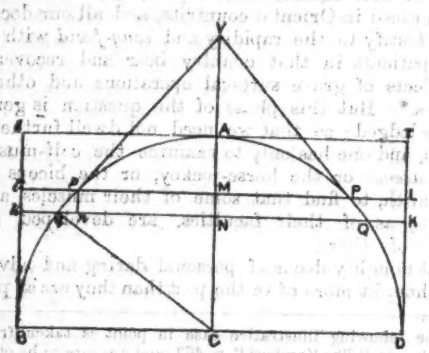


Fig. 1.

A. Well, on the whole, I think I should begin by trying the effect of taking a number of equi-distant parallel planes square to the radius A C, and therefore parallel to the plane B C D.

M. You have made a very natural selection; and it will turn out fortunately: though had it not done so, that would have been no reason to be disheartened. In such cases as these we often have to make several trials before we hit upon the right method. We suppose, then, M N to be one of the divisions of A C, and p P, q Q planes taken through these points parallel to the plane B D.

A. What we want to determine then, at the moment, is the area of the strip of the sphere's surface lying between these planes.

M. Yes: and it is tolerably obvious that we shall not be far from the truth if we regard this strip as the surface of the frustum of a cone q V Q, obtained by drawing q p V, Q P V, to meet on C A produced to V, and supposing the triangle Q N V to revolve round N V (after the manner described in Euclid's definition of a cone).

A. No: for M N is supposed to be exceedingly small, and the strip indefinitely narrow, so that we may regard p q and P Q as to all intents and purposes straight lines.

M. Well, do you remember what is the curved area of such a frustum of a cone?

A. It is equal to the rectangle under p q and the circumference of a circle having a radius midway between M p and N q; but of course the circumference of either circle p P or q Q would do equally well, since in the limit these circles are equal.

M. Thus then the curved area of our frustum $= 2\pi . q\,N . p\,q$.

A. How does this help us? Both q N and p q are variable, each changing with the change of the position of the element M N.

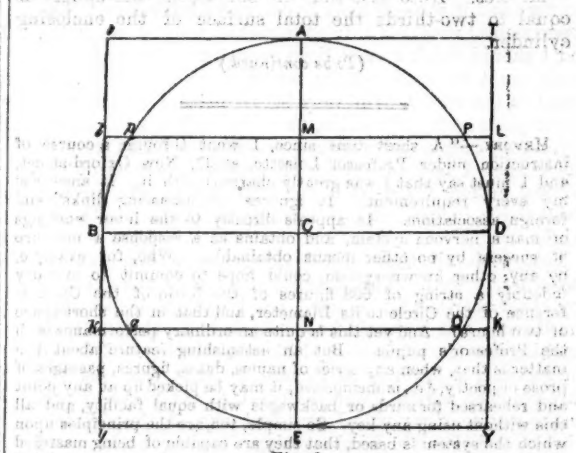


Fig. 2.

M. The obvious resource is to compare p q with M N, and q N with B C. Maybe when we substitute what we thus obtain we may get a constant from the combination of two variables. Since you have to compare p q with M N, it will clearly be well to draw p n square to q N; also we had better join q C, so as to be able conveniently to compare q N with the radius of the sphere.

A. Let me see; p q is to p n, or M N, as q V is to V N; and q N is to q C (or B C) as V N is to q V, the converse of the ratio just obtained. I see my way clearly now, for—

$$p\,q : M\,N :: B\,C : q\,N$$

so that,

$$q\,N . p\,Q = B\,C . M\,N,$$

a constant quantity.

M. The area of the strip of the sphere between p P and q Q is equal then to—what?

A. To $2\pi . B\,C . M\,N$; that is to a cylindrical surface having the height M N and standing on the circular base B D. This of course is the same as the cylindrical surface obtained by completing the cylinder B t A T D on circular base B D and producing the planes p P, q Q to meet this cylinder in l, L, k, K.

M. You will see that this enables you to determine the whole area of the hemisphere. For, each strip of the sphere being equal to the corresponding strip of the enclosing cylinder, it follows that the curved surface of the cylinder t B D T is equal to the curved surface of the hemisphere B A D.

We have in fact this simple result:—If a sphere A B E D, Fig. 2, is enclosed within a cylinder t T Y y, the surface of sphere is equal to the curved surface of the cylinder. Also if any plane as l p P L is taken parallel to the base of the enclosing cylinder, the curved area of the part p A P of the sphere is equal to the curved area of the cylinder t T L l.

A. Can we not thus compare the area of the sphere with that of one of its great circles?

M. We can very readily do so. For the curved area of the cylinder t T Y y is equal to the rectangle under the height and the circumference of the base $= 2$ A C. 2π. B C$=4\pi$(B C)$^2=4$ times the surface of a great circle of the sphere.

A. So that if we divide A E into four equal parts in A M, M C, C N, N E, and draw l M L, B C D, k N K parallel to t T or y Y, the area of the sphere is divided into four equal parts, each equal to a great circle of the sphere.

M. Yes. Note also that the surface of the sphere is equal to two-thirds the total surface of the enclosing cylinder.

(To be continued.)

MEMORY.—"A short time since, I went through a course of instruction under Professor Loisette, at 37, New Oxford-street, and I must say that I was greatly charmed with it. It answered my every requirement. It ignores all harassing links and foreign associations. It appeals directly to the inner workings of man's nervous system, and obtains as a response a measure of success by no other means obtainable. Who, for example, by any other known system, could hope to commit to memory indelibly a string of 608 figures of the Ratio of the Circumference of the Circle to its Diameter, and that in the short space of two hours? And yet this is quite an ordinary performance with the Professor's pupils. But an astonishing feature about the matter is that, when any series of names, dates, figures, passages of prose or poetry, &c., is memorised, it may be picked up at any point and rehearsed forwards or backwards with equal facility, and all this without using any key. So simple, too, are the principles upon which the system is based, that they are capable of being mastered with the greatest ease by persons of all sorts and ages. So satisfied am I with the system as a means of scientific memory-training, that I am convinced that at some not very distant date it will form part of the curriculum at our schools. But of what use, it will be asked, is all this to telegraph clerks? Have they no need for improved and cultured memories? Are they so conversant with all that goes on around them, that when they get a sheet of almost undecipherable flimsy, they can call upon the natural memory to aid them? I think not—nay more, I am sure they are not. Nevertheless, were their memories once trained, an impression once made would endure for ever, and there would be no question of whether Mr. So-and-So or Mr. Somebody-else were member for such-and-such a place. Further than this, I am convinced that there is nothing which a telegraph clerk could study with better advantage, or with a prospect of securing a greater return for the outlay. A short time since a youngster walked into the Professor's room for a lesson, saying he had been trying for some months, so bad was his memory, to learn the Morse Code. The Professor had never before seen the alphabet; nevertheless, down sat the youngster beside him, brought out a copy of the code, and in thirty minutes had it as perfect as any member of the service. I may add that the Professor has introduced his method of learning Morse's Code, and also the Army Flag Signalling Code, into his new edition of his lessons, together with more than one thousand applications of his system, making his the most complete and exhaustive, as well as the most natural and effective, system of memory ever taught. This little incident may help to show how easy it is to educate the memory when once we set about it in rational and natural manner."—*From the "Telegraphist," June* 1, 1885.

LIFE IN DEATH.

BY WILLIAM CURRAN.

NO one can have read extensively in any species of literature without coming across passages or occurrences, which must—at first sight, at least—appear to him to be incredible, if not absolutely impossible. Nor is this experience peculiar to works of fiction, in which it would, of course, be more excusable than elsewhere; it obtains also in the graver productions of the literary pen, and exaggeration rather than diminution is *the* characteristic of the *genus irritabile vatum* everywhere. Passing by, therefore, as being in a measure privileged, the "words that breathe, and the thoughts that burn" of the poet, we will descend into the lower plain of the historian, and endeavour to show that, so far as certain escapes or occurrences narrated by the latter are concerned, "truth is sometimes stranger than fiction."

Without stopping to discuss the differences that are produced in wounds inflicted by modern weapons and those that are due to the appliances used in former times, we may glance at the constitutional capacities for endurance, &c., that peculiarities of soil, climate, and food impress upon certain races, and so avoid technicality of all kinds. It is well known that man in the savage or semi-civilised condition has those organs of sight, hearing, touch, and the like, with which he has to contend for his support with the beasts that perish, more highly or sensitively developed than his brother of the city or the plains; and as an illustration of this, we may point to the fact, noticed in all the papers, that the Maories who lately visited this country always saw land before any of their fellow passengers. The savage man, *pur sang*, can sustain with impunity an amount of exposure and suffering that would certainly prove fatal to his more civilised brother, and the insensibility with which the American Indians, for instance, endure initiatory and other tribal tortures is simply astounding. A similar measure of imperturbable indifference to pain, and even death, has been noticed in Oriental countries, and all our doctors in India testify to the rapidity and *sang-froid* with which their patients in that country bear and recover from the effects of grave surgical operations and other like injuries.* But this phase of the question is generally acknowledged; so that we need not dwell further upon it here, and one has only to examine the calf-muscles of the *danseuse* or the horse-jockey, or the biceps of the blacksmith, to find that some of their muscles, as well, perhaps, as of their faculties, are developed at the expense of others.

That doughty deeds of personal daring and adventure were thought more of in the past than they are at present,

* The following illustrative case in point is taken from Dr. Livingstone's "The Zambesi," p. 463, and appears to be otherwise worthy of reproduction in this connection. A native woman was, he says, when brought in, "found to have an arrow-head eight or ten inches long in her back, behind the ribs, and slanting up through the diaphragm and left lung towards the heart. She had been shot from behind while stooping. Air was coming out through the wound, and it was not deemed advisable to attempt any operation. One of her relatives, however, cut out the arrow and a part of the lung, and, strange to say, she not only became well, but stout." The late eminent military surgeon Guthrie used to say that wounds of the diaphragm never healed, but here is an instance to the contrary; and I have been told by a missionary, who saw the man, of a follower of King Mtesa who had been stabbed in the back, the spear penetrating near the scapula posteriorly and escaping through the chest in front *on the opposite side*, thus showing that both lungs had been ruptured. The hæmorrhage (which was, of course, frightful!) was restrained by an infusion of hot coffee being poured into the wounds, and—he recovered.

XUM

may be at once admitted, and those hand-to-hand encounters we hear so much of in the pages of Gibbon and other writers are now rarely witnessed. Krupp guns and Martini-Henry rifles have so entirely revolutionised the art of war as to throw mere physical strength into the background, and place men, in the aggregate, on a level. Moreover, the atmosphere of the East has never been favourable to the enunciation of truth for truth's sake, and it was the interest as well as the desire of the Crusading writers to exaggerate the performances of their leaders and masters.

Nor need we go back to the Crusades for examples in point. They are to be found much nearer home, and deeds are ascribed, by serious writers, to some of our heroes in the East which would do no discredit to the prowess of a Cœur de Lion or even of a Saladin. Thus, describing some of the hand-to-hand encounters that took place at Meeänee, Sir Charles Napier is represented by his brother as saying ("The Conquest of Scinde," Part II., p. 320) that, "Fitzgerald's sword on its descent went shear through shield and turban and skull, down to the teeth," and Captain Creichton is said to have assured Swift (Works, Nimmo's Ed., p. 531) that, "Fowler (a Covenanter) aimed a blow at me, but I warded it off, and with a back stroke cut the upper part of his skull clean off from the nose upward." Dean Milman caps this narrative with an account he gives of the strength and skill of one, Ali, who, it appears ("The History of the Jews," Vol. II., p. 96), "Clove the skull of Marhāb, the great champion of the Jews (of Khaibor), through his buckler, two turbans, and a diamond which he wore in his helmet, till the sword stuck between his jaws," and whether the weapons used on these occasions were of Damascus or Toledo manufacture, we are unable to say. All we know is, that no such results follow from sabre blows or cuts in these our degenerate days.

So keen is the instinct of self-preservation, or the love of revenge, that men—aye, and women, too—have been known to achieve results under their influence which they would scarcely think of at any other time, or under any other impulse; and it is well-known that the excitement of battle and the hope of conquest have often enabled a handful of men to hold their own against overwhelming odds, and induced individuals amongst them to undertake enterprises that would in any other situation appear impossible. It is, doubtless, to these feelings that we owe some of the displays noted within; and the greater strength or ferocity of mountaineers is universally acknowledged. The two following stories will enforce and illustrate these points:—

Describing an encounter that took place in the reign of Robert III., between a body of Highlanders and a party of Lowlanders, Mr. Tytler says ("The History of Scotland," Vol. I., pp. 93-4), that "Lindsay had pinned* one of these 'mountaineers,' a brawny and powerful man, to the earth; but although mortally wounded, and in the agonies of death, he writhed himself up by main strength, and with the weapon in his body, struck Lindsay a desperate blow with his sword, which cut him through the stirrup and steel-boot into the bone, after which his assailant instantly sunk down and expired." And General Napier mentions a very similar struggle between a soldier of the 22nd Regiment and a Belooche swordsman. His account of it runs as follows ("*ut supra*," Part I., p. 317): "A soldier, bounding forwards, drove his bayonet into the breast of a Belooch. Instead of falling, however, the rugged warrior cast away his shield, and seizing the musket with his left hand, writhed his body forwards on the bayonet, until he could avenge himself with one sweep of his sword." He adds that a "Belooch requires no second stroke," and that "both fell dead together." Very tragic, no doubt, but—farther deponent saith not.

We may quote the following from Scott, without in any way vouching for its probability in connection with this kind of mountain warfare, and leave the narrative to speak for itself. Describing the fierce and fatal struggle that took place in 1652 between Evan Cameron, of Lochiel, and an English officer of great strength, Sir Walter says ("Tales of a Grandfather," 1872, pp. 501-2) that "he (Lochiel) had a personal rencontre strongly characteristic of the ferocity of the times." Being singled out by the officer above referred to, and "as they were separated from the general strife, they fought in single combat for some time. Lochiel was dexterous enough to disarm the Englishman; but his gigantic adversary suddenly closed on him, and in the struggle both fell to the ground, the officer uppermost. He was in the act of grasping at his sword . . . . and was naturally extending his neck . . . . when the Highland chief, making a desperate effort, grasped his enemy by the collar, and, snatching with his teeth at the bare and outstretched throat, he seized it as a wild cat might have done, and kept his hold so fast as to tear out the windpipe. The officer died in this singular manner. Lochiel was so far from disowning or being ashamed of this mode of defence that he was afterwards heard to say it was the sweetest morsel he had ever tasted."

(To be continued.)

* Apropos of this "pinning," reference may be made to the case of the young Russian sailor, mentioned in almost all works on surgery, who, though pinned to the deck by a trysail-mast, which it penetrated, through his body, to the depth of an inch, yet recovered, and was able to resume his laborious employment. The writer may be here permitted to say that he has seen experiments tried on the "subject," &c., for the purpose of verifying or disproving these narratives, and that in no instance have the results corresponded with the effects said to be realised under the conditions narrated above. Victor Hugo mentions ("Histoire d'un Crime," p. 455), the case of "un ouvrier, percé d'outre en outre (qui), s'arracha du ventre la bayonnette et en poignarda un soldat."

THOUGHT AND LANGUAGE.

By ADA S. BALLIN.

XII.

TO give a detailed account of the signs which make up the natural gesture language would be a gigantic undertaking; but in order to show how these word-pictures are composed, I may here cite a few of the more complicated expressions used by deaf mutes. Thus, the sign for *wet* is to wet the right forefinger with saliva; and to express *flowing* this action is combined with an illustration by both hands of the wave-like action of water. For *stone* the sign for *hard* (striking the knuckles) is combined with the act of throwing, while for *building stone*, in addition to the preceding gestures, the hands are laid several times one over the other. *Precious stone* is represented by stone, colour, and the action of counting out money into the left hand to show the value of it. For *hospital* the signs are those for *house* and *ill*—a similar combination to the German *krankenhaus*. For *horse* the apparent height of the animal is shown, then the index and middle fingers of the right hand are straddled over the index of the left, to show that it is used for riding, after which the right foot

is stamped on the ground, as when the animal is impatient.

As may easily be imagined, the gesture language has no more inflections than the Chinese, and the same sign stands for *walk, walker, walking, walked, walkest*, &c., hence, theoretically, the various parts of speech may be supposed to be not easily distinguishable, but this is rarely the case, as words or signs are understood by the context. The deaf mute arranges his sentences somewhat after the manner of the Latins, always putting first the word which he considers the most important. Thus, the sentence "I should die of starvation if I had no food," would be "Food (imitation of eating)—no (shake of head)—I (point to self)—dead (relaxation of muscles and leaning back with eyes closed). Questions are asked by the deaf mute by means of inquiring glances, as: Have you any bread? would be "Bread (imitation of act of cutting it)—you (pointing to the person addressed)—and a look of interrogation. That we ourselves ask questions in this way by facial expressions is a matter of everyday experience.

Dr. Steinthal has said that the verbs "to have, to be, to be able, and similar signs, are wanting to the natural sign-language of the deaf and dumb, and, he adds, without the help of these abstract signs, the whole play of ideas is obscure;" but, although a great authority on the subject, Dr. Steinthal is wrong in the present instance. Of course, as above remarked, there is no regular conjugation of the verb; but none the less does it exist for practical purposes. If asked, "Can you?" or "Will you do so and so?" the deaf mute answers with a nod or a shake of the head, "I can" or "I won't." When he wishes to be more emphatic, emotional expressions come into play. If he wishes to say "I *will* fight," he rolls his fists with a look of much meaning, not likely to be mistaken. To prefer the request "*May* I go out?" he points out of doors with a look of entreaty. The imperative with *shall* and *must* are expressed by volitional gestures. To *have*, the subject is pointed at with a nod of affirmation, or a shake of the head in case of negation. Thus, "I have eaten," I (point to self) eat (act of eating), yes (nod). "He has the meat," he (point to him, or, if absent, describe characteristic mark, as the man with a long beard) meat (pinch up flesh on back of hand), yes (nod). All the signs hitherto mentioned are natural signs common to all, but there is a very widespread sign for "done," "already," &c., which is apparently conventional: this is to strike the outside of the right hand on the flat palm of the left, as in the action used to signify cutting bread, but without the sawing movement, hence it seems to mean "cut off," "finished with." This sign is generally used for the past tense, as "I—cry—done," for "I cried." If a boy were to point first to himself, then to another boy, make the action of biting, place his hand at the level of his knee, and make the sign above described, I should put it into words as follows, "When I was as high as my knee I bit him."

There is an inherent logic in this gesture-language, for while our words are conventional and require to be defined to those who do not understand them, *its* words are in themselves definitions. Thus spring is the beautiful time when the sun is warm, the ice and the snow have gone, and the flowers and grass come. *Rain* is the *wet* that falls from the sky; the dumb child wets the tips of his forefingers, and makes a movement from above downwards with both hands. The Turk is the man that wears a turban.

Uneducated deaf-and-dumb children, being cut off from participation in the more complex thoughts of others, are, as already said, limited in their ideas to their own experience of men and things, like ordinary children who have not been taught better, and, like savages, they attribute to things they do not understand causes and characteristics most analogous to their previous experience. They are at the myth-making stage. For them the stars are candles in the sky, and the horizon is a dome which touches the ground, and they long to reach it and climb into the sky. One big boy, who had probably seen his mother making bread, told me that before he learnt on the oral system he used to think his mother made his little brothers and sisters out of flour; and another said he thought she bought the baby from a shop. They think rain is caused by somebody pouring water out of a water-can, an idea in which they agree with the ancients, who believed in Jupiter Pluvius. From all this it may easily be imagined that the deaf and dumb possess few, if any, abstract ideas. Thus their ideas of space and time are very crude. Their ideas of time are marked by their physical experiences: *mid-day* is when they eat with spoons, knives, and forks; night is when it is dark and they go to sleep. The *past*, by a mode of thought similar to that expressed in our own word, is what they have *passed by*, while the future is what they will come to. Thus the dumb person expresses *present* by "here," *past* by "behind me," and *future* by "in front of me." Yesterday before I slept once. For *the day before yesterday* he puts two fingers over his shoulder. But he gains other simple abstract ideas from his own observations, and communicates them accordingly, thus:—To mean *everyone*, he describes with both arms as large a circle as he can in the air; while for *many*, he holds up his ten fingers over and over again with a look of astonishment. To indicate *shame*, he points to himself, then to his lips (red), and afterwards to his cheeks, and turns his lowered head from the person with whom he is conversing, making up a pictorial representation of the facial expression which accompanies shame.

The deaf and dumb in like manner soon get ideas of propriety. A boy visiting a deaf and dumb school indicated the word *black* by pointing to his dirty finger-nails, an action which drew from the children the comment that his language was ugly, and disgusted them extremely. From their experience of life they gather also ideas of the value of truth. Thus, a dumb person, when talking of a *lie*, makes an action as if speaking, and moves his hand downwards with an expression of contempt, while for *to speak truth* the action of speaking is imitated, and the hand laid on the heart. This action used to imply *truth* is, of course, an indication of *belief*, and a curious analogy may be drawn between it and our word *creed*. Creed is derived from the Latin *credere*, to believe, which is itself a compound of *cor(d)*, Greek *kardia*, our *heart*, and the root *dha*, to place; compare Sanscrit *'srad-dadhâmi*. So that to believe is to feel at heart; to speak truth is to speak from or with the heart.

An interesting point in the growth of the deaf mute's sign language is that since his signs are derived from aspects of things, he is liable to choose as characteristic signs of a class, properties which that class possesses in common with other classes hitherto unknown to him. Thus, he soon finds some of his expressions to be too general. For example, he has named the goat from its property of *butting;* but he afterwards finds that other animals also butt with their horns, then he specialises by adding some other attribute, and signifies goat as the *butter with a beard*. After using the general sign of *drinking* to mean *water*, he discovers that other liquids,

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such as beer and wine, are drunk, and then water becomes for him the liquid that is *drunk*, and also used for *washing*. In a similar way the ordinary child learning to speak, uses words in a more general sense than that in which they are used by his teacher. A baby who has learnt the word *papa* does not use it to signify his own father only, but applies it to all men, and I believe that the reason of this is that he has associated the word *papa* with certain characteristics, such as the wearing of trousers, &c., the possession of a deep voice, and having hair on the face. Thus the word means to him certain aspects which many have in common; he does not distinguish at first the special characteristics which mark off his father as an individual from all other individuals. The lower we go in intellect the greater is the tendency to see likenesses to the exclusion of differences. This is equally so with the young child and the savage. Thus a young language is chiefly figurative. But as the mind, by increased experience and the logical development brought about by this, becomes more analytical, differences are attended to in the degree that they merit, and the likenesses which formerly found expression are apt to be overlooked, and even the origin of the words to which they gave rise forgotten. Who at first sight would imagine that *creed* in its etymological meaning is a *something given from the heart*. Professor Sayce has beautifully expressed this tendency in the words, "Language is the treasure-house of worn-out similies—a living testimony to the instinct of man to find likeness and resemblance in all he sees."

MR. H. R. GOODWIN, of the North Manchester B.C., has recently completed perhaps the most remarkable ride ever yet accomplished on the bicycle. Leaving Land's End on June 1, he rode to John o' Groats; having reached which point in seven and a-half days, he at once turned southward, and arrived again at Land's End on the 16th, having completed the double journey from one extremity of England to the other, or about 1,800 miles, in less than sixteen days. From Land's End Mr. Goodwin rode to London, where he arrived on the 19th, the total distance ridden being 2,050 miles, in exactly nineteen days, or an average of about 108 miles per day. He rode a 40 in. "Facile," which carried him well from start to finish, and he arrived in London fresh and well.

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED.—For many years this well-known photographic business has existed as a "Company"—in the ordinary acceptation of the word—in name only. It has latterly been pretty generally understood that the enterprise was a proprietary one, carried on by the late Lord Mayor, with the assistance of his son, Mr. Charles G. Nottage, Mr. Howard Kennard also being a partner. The recent death of the first-named gentleman, however, has induced the surviving partners to convert the business into a "Company," in the fullest financial sense, and a prospectus (which appears in another part of this number) has been issued, setting forth that the required capital is £90,000, to be realised by the issue of 18,000 shares of £5 each. We are not particularly concerned with the financial aspect of the question, but, considering the growing increase in the numbers of amateur photographers, and the fact that the business of the proposed Company would largely consist in supplying their wants, it would seem to be a speculation sufficiently sound from an investor's point of view, and one offering to the amateurs before-mentioned the opportunity of forming themselves, as shareholders, into a self-supply association on advantageous terms. The vendors are reliant as to the immediate success of the undertaking; and although promoters are often over-sanguine in prospectuses, yet in this case the reliance is justified, inasmuch as the profits of the business are actually existent, not merely estimated. The vendors take a third of the purchase-money in shares, and agree to accept no remuneration for their services as directors until 7 per cent. has been paid to ordinary shareholders; this, at any rate, testifies to their own faith in the successful working of the Company. But, as we have before said, we have no concern here with questions of purely financial interest, and call attention to this matter in these pages only because we knowingly include amongst our readers a large number of amateur photographers, who may be specially interested, and pleased to have their attention directed to the prospectus alluded to.

FIRST STAR LESSONS.

BY RICHARD A. PROCTOR.

THE constellations included in the twenty-four maps of this series are numbered throughout as follows (the names being omitted on the maps, to clear these as far as possible from all that might render the star-grouping less distinct):—

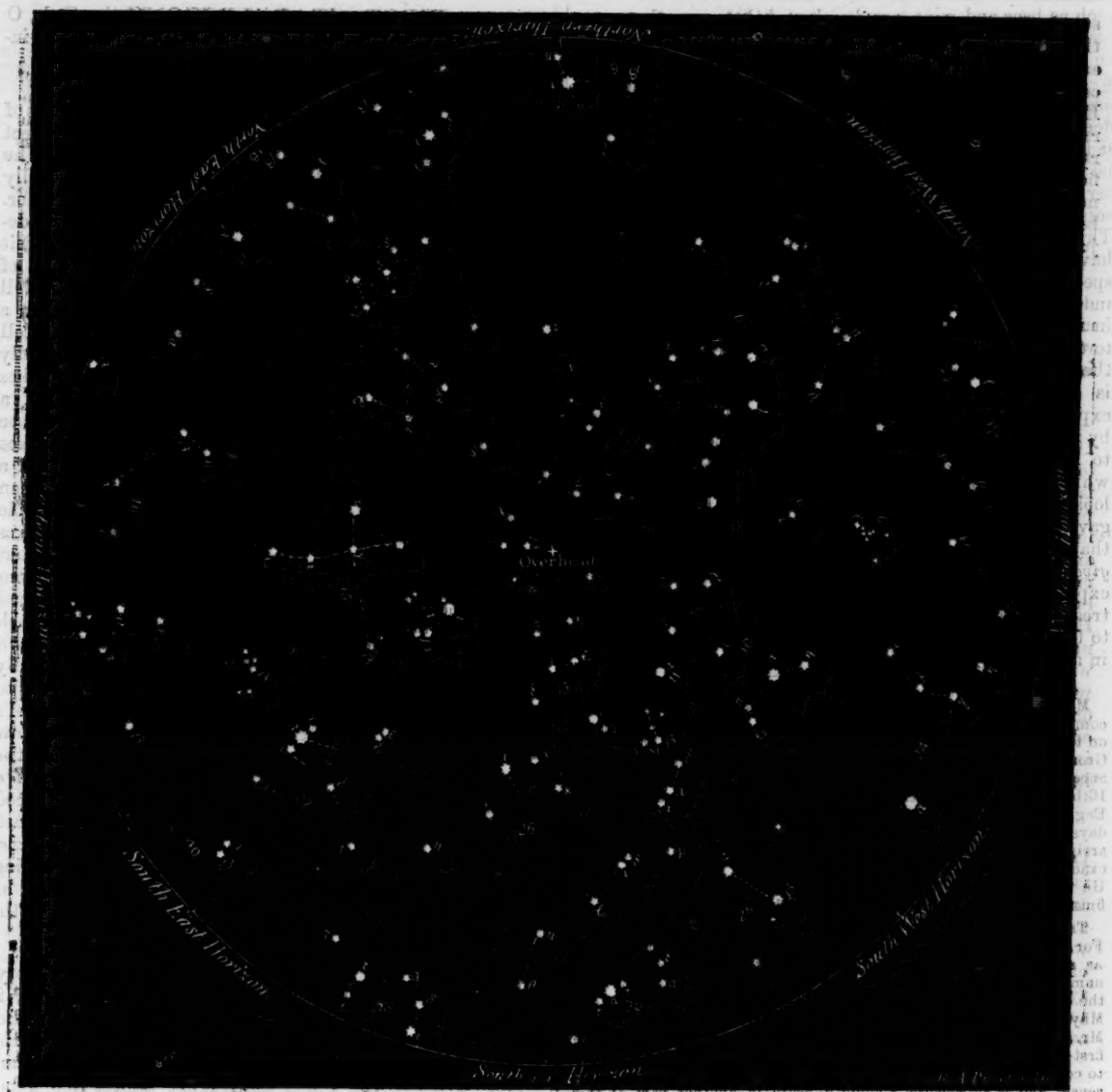
1. *Ursa Minor*, the *Little Bear* (*a*, the *Pole Star*).
2. *Draco*, the *Dragon* (*a*, *Thuban*)
3. *Cepheus*, *King Cepheus*.
4. *Cassiopeia*, the *Lady in the Chair*.
5. *Perseus*, the *Champion* (*β*, *Algol*, famous variable).
6. *Auriga*, the *Charioteer* (*a*, *Capella*)
7. *Ursa Major*, the *Greater Bear* (*a*, *β*, the *Pointers*).
8. *Canes Venatici*, the *Hunting Dogs* (*a*, *Cor Caroli*).
9. *Coma Berenices*, *Queen Berenice's Hair*.
10. *Boötes*, the *Herdsman* (*a*, *Arcturus*).
11. *Corona Borealis*, the *Northern Crown*.
12. *Serpens*, the *Serpent*.
13. *Hercules*, the *Kneeler*.
14. *Lyra*, the *Lyre* (*a*, *Vega*).
15. *Cygnus*, the *Swan* (*a*, *Arided*; *β*, *Albireo*).
16. *Pegasus*, the *Winged Horse*.
17. *Andromeda*, the *Chained Lady*.
18. *Triangula*, the *Triangles*.
19. *Aries*, the *Ram*.
20. *Taurus*, the *Bull* (*a*, *Aldebaran*; *η*, *Alcyone*, chief *Pleiad*).
21. *Gemini*, the *Twins* (*a*, *Castor*; *β*, *Pollux*).
22. *Cancer*, the *Crab* (the cluster is the *Beehive*).
23. *Leo*, the *Lion* (*a*, *Regulus*).
24. *Virgo*, the *Virgin* (*a*, *Spica*).
25. *Libra*, the *Scales*.
26. *Ophiuchus*, the *Serpent Holder*.
27. *Aquila*, the *Eagle* (*a*, *Altair*).
28. *Delphinus*, the *Dolphin*.
29. *Aquarius*, the *Water Carrier*.
30. *Pisces*, the *Fishes*.
31. *Cetus*, the *Sea Monster* (*o*, *Mira*, remarkable variable).
32. *Eridanus*, the *River*.
33. *Orion*, the *Giant Hunter* (*a*, *Betelgeux*; *β*, *Rigel*).
34. *Canis Minor*, the *Lesser Dog* (*a*, *Procyon*).
35. *Hydra*, the *Sea Serpent* (*a*, *Alphard*).
36. *Crater*, the *Cup* (*a*, *Alkes*).
37. *Corvus*, the *Crow*.
38. *Scorpio*, the *Scorpion* (*a*, *Antares*).
39. *Sagittarius*, the *Archer*.
40. *Capricornus*, the *Sea Goat*.
41. *Piscis Australis*, the *Southern Fish* (*a*, *Fomalhaut*).
42. *Lepus*, the *Hare*.
43. *Columba*, the *Dove*.
44. *Canis Major*, the *Greater Dog* (*a*, *Sirius*).
45. *Argo*, the *Ship*.

Gossip.

BY RICHARD A. PROCTOR.

I HAVE read letter 1,740, by "Commentator," with intense pain—chiefly because it was my own action in forwarding an extract from the *New York Tribune* which elicited "Commentator's" ill-judged remarks. I cannot understand how anyone can imagine that the expression of an opinion, no matter how far that opinion may differ from his or her own, can justify personal objurgation in any form. "Commentator" would not, I presume, have ventured to say to George Eliot herself what he (or she) has unfortunately been allowed to say in these columns. At least, I hope not, for his (or her) own sake. What opinion was formed by all whose opinion was best worth considering, "Commentator" knows. It is a matter of small moment that George Eliot was honoured by the conventionally noblest in the land, from the Queen downwards (conventionally)—it is more important to note that she was esteemed by the wisest and the best. Her philosophy was kindly, gentle, and honest. Less original than most readers of her works imagined, she had learned in the best schools; and she taught more effectively than those from whom she had in reality derived the larger portion of her doctrine.

OF the relations between George Lewes and George Eliot it becomes none to judge, unless it can be shown



NIGHT SKY FOR JULY (First Map or Pair).

Showing the heavens as they appear at the following hours:—

July 3 at 10½ o'clock. | July 11 at 9½ o'clock. | July 18 at 9½ o'clock.
July 7 at 10 o'clock. | July 14 at 9½ o'clock. | July 22 at 9 o'clock.

that any one was personally wronged in the matter. Even then judgment by an outsider would be improper. A teacher, whom "Commentator" appears to accept, has expressed very strong condemnation of such judgments as his (or hers). The manner in which "Commentator" views the matter, is, however, too outrageous to be harmful, save to himself (or herself). Even those who most regretted George Eliot's decision, even those who in her lifetime openly condemned her conduct in this matter, applied no such epithet, directly or indirectly, as "Commentator" with amazing fatuity has attempted to fasten on her. One might as well apply such a term to a second wife who was a sister of the first, because the law pronounces such a marriage illegal. To all intents and purposes, save as regards the letter of the law, George Eliot was George Lewes's wife. The relation contemplated in marriage has seldom—perhaps never—been more beautifully fulfilled. The law would have made Mr. Lewes a criminal had the legal ceremony been performed, whether by priest or magistrate; and to persons with the opinions (I may say the faith) of George Lewes and George Eliot the legal ceremony would have had no intrinsic value. The only point they had to consider was whether the tie was binding on each, and whether each could trust the other to regard it as such. No one who knew either, certainly no one who under-

stands the meaning of George Eliot's life, can doubt that they were united by a tie which was to them perfectly sacred. Whether, the world being what it is,—most easily offended where it offends most readily—George Eliot and George Lewes should have sacrificed themselves rather than offend the worse minded (I mean most literally *sacrifice* themselves, because they would have sacrificed the better part of their life work, of what the world now owes to them) is another matter. It would not have been just to have so sacrificed themselves, though it might justly have been regarded as sublime.

BUT would the world—meaning its worse part—have understood them if they had done so? I think not. The world would have judged and condemned them more foully than it has condemned them already.

THERE is a case in point. I will not mention names; I can hardly touch on facts; yet the facts are well known to a few. In the case I have in my thoughts, the woman is married, and has suffered grievous wrong. The sacrifice which the world's worse part (making no sacrifices itself in such things) would have claimed from George Eliot and George Lewes has been made by this woman and the man, who loves her as his life, and esteems her as the bravest of her sex. Thus have two lives been embittered. Has the world's worse part understood—*nay*, but neither name of these two can be mentioned, before all but a few who know, and a few more who can understand goodness, without the foulest abuse from those who only know and only really understand that they themselves are incapable of self-sacrifice in such matters,—or even of self-sacrifice in what, to persons of the class to which George Eliot belonged, is not held worthy of a thought.

THAT George Eliot "anonymously preached per Dinah, while she utterly disbelieved Dinah's rhetoric," is a roundabout and ill-worded saying scarce worth answering. As a matter of fact, George Eliot pictured a Methodist of the best type preaching as such a person would. I apprehend, moreover, that with the essence of what Dinah taught George Eliot was perfectly in sympathy. George Eliot's life was beautiful, in its tender kindliness, and her philosophy was as gracious and loving as it was wise.

I OBSERVE that my friend the Editor considers he has *seen* lightning-flashes passing from the ground to the storm-cloud. His words are that "*pace* Professor Tait," he has "distinctly seen lightning strike *upwards*." Professor Tait did, I know, assert this to be impossible, in a lecture in which he was good enough to reproduce my own reasoning (in an article on "Electric Lighting," published in the *Cornhill Magazine* a few months before) not only on this point, but on the actual brightness of the electric flash, and some other points respecting which I had presented some rather novel points. I was particularly struck by this because, shortly before, he had criticised a work of mine in that back-stabbing manner for which he first acquired renown in Professor Tyndall's case. The point of this stiletto method consists in avoiding anything like direct correction or any statement as to why, where, or how, particular passages may be erroneous, the crafty critic simply quotes such passages with the remark, If *this* is right, I am all wrong, the innocent reader imagining this last alternative to be impossible or it would not be suggested. Another way is to quote a passage and exclaim, "These be thy Gods, O Israel," or the like, leaving the reader to suppose—incorrectly—that there is something very wrong.

WITH all respect for my friend the Editor's keenness of observation, and (I need hardly say) the most perfect reliance on his account as presenting what he thought he saw, I venture to say that no human being can really see whether a lightning-flash goes one way or the other. I would invite the Editor to consider the evidence derivable from what is called "personality" in transit observations. We know, by comparing the work of different observers that *no* observer can be trusted to tell within the tenth of a second, *surely*, the instant when a "wire" (so called) reaches a star, *i.e.*, no one can tell whether at the particular instant when the wire actually does reach the star, it has really reached it, or has already passed it, or is short of it, by one-tenth of a second's apparent motion of that star. Now let us see what an observer really claims to do when he undertakes to decide whether the earth end or the cloud end of a flash appeared first. Suppose the flash to be fifteen miles long, which for a flash whose whole course is visible is a goodly allowance. Then it is known that the flash takes less than the 10,000th part of a second in traversing that distance, whether it passes from cloud to earth or from earth to cloud or both ways simultaneously. Actual timing of the duration of the light indicates a much shorter time, usually, even than this, (it is well known that Talbot photographed fine printing on a rapidly whirling wheel, illuminated by an electric flash, so minute was the change in the position of the wheel's rim while the light lasted). In claiming, then, to know which way an ordinary lightning-flash travelled, the observer claims a keenness of perception *more than a thousand times greater* than that of our most experienced astronomical observers. All that has really happened when a lightning flash has been *seen* to strike upwards, has been that the observer has chanced to be looking towards the earth when the flash appeared, so that he has been first conscious of the appearance of the earth-end of the flash.

I HAVE not been content to let this be a mere theory, though I take it the reasoning, rightly understood, is convincing. I have tested the matter repeatedly. Let several observers (a family of them will do) watch the progress of a thunderstorm. (In America, where I am now writing, the opportunities are almost too good, thunderstorms being very frequent, and in many of them the lightning flashing continuously.) Let half the observers direct their attention to the storm-cloud or clouds, the other half to the horizon. It will be found that the self-same flash will be *distinctly seen* by one set to strike *downwards*, while by the other half it will be as distinctly seen to strike upwards. In like manner the self-same horizontal flash will be distinctly seen to pass from right to left, and as distinctly seen to pass from left to right, according to the way in which the observer chances to be looking at the instant.

COL. TUPMAN, commenting at the Astronomical Society, on my theory that meteors and comets were originally projected from the interior of suns or of planets in the sunlike state,—a theory advanced thirteen years ago before Mr. Denning had discovered meteors of long-lasting radiants, moving therefore with immense rapidity—argued that the theory is contradicted by the circumstance that the average velocity of meteors is

that due to parabolic orbits. That was the belief of astronomers when my theory was first published and till Mr. Denning made his important discovery. All I did in the paper on which Col. Tupman supposed he was commenting, was to show that my theory accounted for the enormous velocities which Mr. Denning's discovery absolutely demonstrates, if accepted—and Colonel Tupman it was who first maintained that it must be accepted, being established by incontrovertible evidence. The argument, then, stands thus: I advance a certain theory about meteors and comets, when as yet moderate velocities only had been observed; Colonel Tupman brings before the Astronomical Society decisive evidence of enormously greater velocities; I show that my theory will account for them (which no other theory *will* do); he replies (?) "the theory cannot be sound, for no such velocities exist!" It seemed to me as though a more marvellous bull had scarcely ever been managed.

Reviews.

SOME BOOKS ON OUR TABLE.

Text-book of Structural and Physiological Botany. By OTTO W. THOMÉ and ALFRED W. BENNETT. Fifth edition. (London: Longmans, Green, & Co. 1885.)—Whether we regard this as a text-book for the student, or as a hand-book of reference for the advanced botanist, it really seems as though it would be difficult to improve upon it. In fact, the mere mention of the appearance of five editions of Professor Thomé's work in its English dress in eight years will suffice to show how thoroughly it has filled something approaching to an absolute void in its own department of botanical literature, and how valuable it has been found by the numerous class which it addresses. And assuredly its success has been deserved, inasmuch as it is devoid of "cram" in any sense, and is educational in the highest. The histology, external form, structure, morphology, and classification of plants are successively treated in detail. Their pedigree, so to speak, is traced from the dim indications of Algæ in the Silurian rocks, down to the vegetation of to-day. A chapter on botanical geography exhibits in succession the leading botanical features of all the known parts of the earth, while a first-rate glossarial index completes the volume, which is further illustrated by something like 600 woodcuts and a coloured map. We may pretty confidently assume that this fifth edition will be very far indeed from being the last one.

The Nomenclature of Diseases. Drawn up by A JOINT COMMITTEE APPOINTED BY THE ROYAL COLLEGE OF PHYSICIANS OF LONDON. 2nd Edition, being the first revision. (London: Harrison & Sons. 1885.)—"In order," says J. S. Mill, in his "Logic" (Book IV., Chapter 4), "that we may possess a language perfectly suitable for the investigation and expression of general truths, there are two principal, and several minor, requisites. The first is that every general name should have a meaning, steadily fixed and precisely determined;" and assuredly it is essential that the name of any given disease and all that such name connotes should be of the most definite possible character. Of course, without some generally-recognised nomenclature of Diseases, statistics worthy of the name in connection with them become impossible; and on the value of trustworthy statistics of disease extending over a sufficiently wide area, it is wholly needless to insist here. But the difficulty or impossibility of tabulating such records (save in a limited and imperfect manner) where three or four different names are employed to designate the same complaint must be apparent at once; and hence the necessity for an authoritative and admitted nomenclature. As far as our examination has extended, the Committee seem to have done their work ably and conscientiously; the sole slip—and that is in all probability a printer's error—that we have detected occurring on p. 135, where "spasomdic" occurs for "spasmodic." A notable and valuable feature in the book is the furnishing of the Latin, French, German, and Italian synonyms of every disease comprised in the list. As a matter of course, every physician and surgeon in the United Kingdom will provide himself with this indispensable book, which, it is to be hoped, in the interest of science will obtain a large Continental circulation too.

How to Draw a Map from Memory. By P. E. SWINSTEAD, B.A. (London). (London: Simpkin, Marshall, & Co.)—We are a little afraid that Mr. Swinstead gives his readers credit for the possession of a particular kind of memory which is by no means common among students. He employs a novel and remarkable system of co-ordinates, consisting of straight lines and more or less complex curves, the *ensemble* of which has all to be remembered. These co-ordinates are printed in red, and the outlines following them are subsequently drawn in black. It may be the novelty of the idea, or, of course, our own stupidity, but it seems to us that the outline of Europe or Africa could be fixed in the mind in considerably less time than the complicated, and seemingly meaningless, pieces of geometrical construction which are to form its substratum.

Denudation of the Two Americas. By T. MELLARD READE, C.E., &c. (Liverpool: C. Tinling & Co. 1885.)—This is a reprint of Mr. Mellard Reade's Presidential Address to the Liverpool Geological Society, and essays to make a quantitative determination (at all events, approximately) of the amount of solid matter annually removed from the continents of the New World by various forms of denudation. Mr. Reade insists, as we think justifiably, on the importance of chemical action as a denuding agent.

Pattern-Making. By a FOREMAN PATTERN-MAKER. (London: Crosby Lockwood & Co. 1885.)—Articles, be they large or small, from the framing of a Nasmyth hammer to the cylinder of the toy steam-engine, which are made in cast-iron or brass, are "cast," that is to say are formed by running the metal of which they are composed in a liquid form, into a mould of the size and shape of the object to be produced, such mould taking the form of a hollow or depression in a tightly rammed mass of peculiar sand known as moulding-sand. But obviously, in order to form such a mould, an original pattern of the article to be cast must be made; and the construction of some of these patterns often presents extraordinary examples of ingenuity. The work before us is of an eminently practical character, and gives the most detailed instructions for the production of the patterns of the component parts of every type of mechanism which are formed by casting. No book with which we are acquainted goes into such minute details on this subject as the volume on our table; in fact, it supplies the apprentice or beginner with a complete course of instruction in his art. Much of the work has seemingly appeared in a detached form in the columns of our contemporary, the *English Mechanic*. In the interests of mechanical art, it is to be hoped that its readers in its book form will be as numerous as they

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must have been in its serial shape. It is an honest and thoroughly trustworthy work.

The Phainomena, or Heavenly Display of Aratos. Done nto English verse by ROBERT BROWN, JUN., F.S.A. (London: Longmans, Green, & Co. 1885.)—Yet another translation of the φαινόμενα of Aratus! This time seemingly to support the theory of the origin of the constellations, very ably maintained in former works by the same author; in fact, the notes, which exhibit a large amount of learning and research, afford the justification for adding one more to the pretty numerous versions of Aratus which have appeared. A considerable number of reproductions of very quaint old engravings, and a map of equatorial stars for the Equinox, B.C. 2084 illustrate the text and notes of Mr. Brown's volume, which should commend itself to all for whom the earliest record of our existing constellations possesses any interest.

Singing in Schools. A Complete Course of Practical Teaching. By ALFRED B. HASKINS. (London: Bemrose & Sons. 1885.)—On the value of singing as an innocent and delightful recreation it would be merely idle to insist; and that it should form part of the school-course of every child with the slightest approach to the possession of "an ear," seems in every respect desirable. And, certainly, if music is to be taught in our public elementary schools, it would not be easy to find a better or more thoroughly sensible and practical manual than Mr. Haskins has given us. His book furnishes abundant internal evidence of the possession on the part of its author of a sound and competent knowledge of his subject, and—what is by no means invariably associated with such knowledge—the faculty of lucidly imparting it. We hope that his work will meet with the success which it undoubtedly deserves.

The Studio, and What to Do In It. By H. P. ROBINSON. (London: Piper & Carter. 1885.)—Primarily addressed to the professional photographer, Mr. Robinson's capital little book may be read profitably and advantageously by every amateur who has ever tried, or who ever proposes to try, to take a portrait. Few of our living writers have done as much as Mr. Robinson to forward the growth of artistic taste in photography, and to render the photograph really a thing of beauty, and not a mere hard, dry, mechanical reproduction of the object depicted. He sustains his well-earned reputation in the present small volume.

Crowded Out; or, Not Hung for Want of Space at the Royal Academy, 1885. Edited by HENRY LASSALLE. (London: Sampson Low & Co. 1885.)—Mr. Lassalle has done a real service to art in the publication of the work whose title heads this notice. By the aid of something like a hundred *fac-simile* sketches drawn by the artist's own hands, of pictures rejected at the Royal Academy, the reader is furnished with the means of contrasting the obvious artistic excellence of some of the paintings which failed to gain admission, with the mass of mediocrity (to say nothing of downright rubbish in places) which appears upon the walls.

The Moon's Rotation, examined by the Newtonian Theory of Gravitation. By THOS. F. TYERMAN. (Oxford: Slatter & Rose. 1885.)—Into Mr. Tyerman's teleological argument we absolutely refuse to enter. Whatever it may be worth (and we have a very definite opinion of its value), it is not Science. His hypothesis of the cause of the coincidence in time of the moon's motions of revolution round the earth and rotation on her own axis may be briefly epitomised by saying that he considers that the gravitating force of the two hemispheres of the earth and her satellite which are facing each other, must act as though producing temporary cohesion; and that, so to speak, the outside hemisphere of the moon being affected by no such force, must tend to go in the direction of the moon's motion of translation, and so turn her round. The proximity of the earth and moon, and the comparatively small difference in their sizes, seem to be advanced as one reason why the quasi-cohesion should exist; but these conditions assuredly do not obtain in the case of Jupiter and his four satellites, or in that of Saturn and Iapetus, in both of which cases we have evidence of the coincidence of their times of rotation and revolution. Nay, were Mr. Tyerman's theory true, there is nothing to prevent its application to the sun and earth. We can only regard his book as an example of misapplied ingenuity.

Blackie's Elementary Text-books. Botany. By V. T. MURCHÉ. *Magnetism and Electricity.* By W. G. BAKER. *Elementary Algebra.* (London: Blackie & Son.)—These text-books, compiled to meet the requirements of the Educational Code, are really well done, and, if intelligently studied, are calculated to impart no inconsiderable amount of rudimentary information. They ought to be useful at once to the teacher and the pupil.

Algebraic Factors. By W. T. KNIGHT, F.S.Sc. (London: Blackie & Sons.)—This little book follows something on the lines of that by Mr. Easton, which we reviewed on p. 56 of our last volume. It will be found useful by the beginner.

Studies in Microscopical Science. Edited by ARTHUR C. COLE, F.R.M.S. (London: Baillière, Tindall, & Cox.)—The usual monthly issue of this excellent work worthily sustains its reputation.

The Imperial Review. April, 1885. (Melbourne.)—This quarterly review, which reaches us from the Antipodes, is of a lighter and chattier character altogether than its English prototypes, containing as it does no less than thirty-eight articles within the compass of 80 pages. What we may term the local element in the essays of which it is made up is conspicuous, if not by its absolute absence, at least by its paucity; the most diverse subjects—literary, social, historical, and political—finding a place or places in its pages. It is very readable.

The Science of Sanitation. By B. SHARP & Co. (London: The Authors'.)—Those who are suffering from the evil sanitary arrangements but too frequently found in our dwelling-houses, may learn from this little pamphlet, the character and sources of the danger to which they are exposed, and the means of rendering their residences pure and healthy.

Cassell's Readable Readers. Third Reading Book for Standard III.; Fourth Reading Book for Standard IV. (London: Cassell & Co.)—If reading does not become a pleasure instead of a toil with the boys and girls who have to use the two books before us, it will not be the publishers' fault. The selections are interesting, amusing, and instructive, and the very numerous illustrations good and apropos, some of the vignettes being really beautiful. This series will surely be popular.

We have also on our table *The American Naturalist, The Sanitary News, The American Druggist, Wheeling, The Tricyclist, The Journal of the Society of Arts, The Medical Press and Circular, Proceedings of the Geological Society, Report of the Association for the Oral Instruction of the Deaf and Dumb, Naturen, Ciel et Terre, C. Hutt's Catalogue of Scarce Books, Electricité, Bradstreet's,*

"Let knowledge grow from more to more."—ALFRED TENNYSON.

Only a small proportion of Letters received can possibly be inserted. Correspondents must not be offended, therefore, should their letters not appear.

All Editorial communications should be addressed to the EDITOR OF KNOWLEDGE; *all Business communications to the* PUBLISHERS, *at the Office, 74, Great Queen-street, W.C.* IF THIS IS NOT ATTENDED TO, DELAYS ARISE FOR WHICH THE EDITOR IS NOT RESPONSIBLE.

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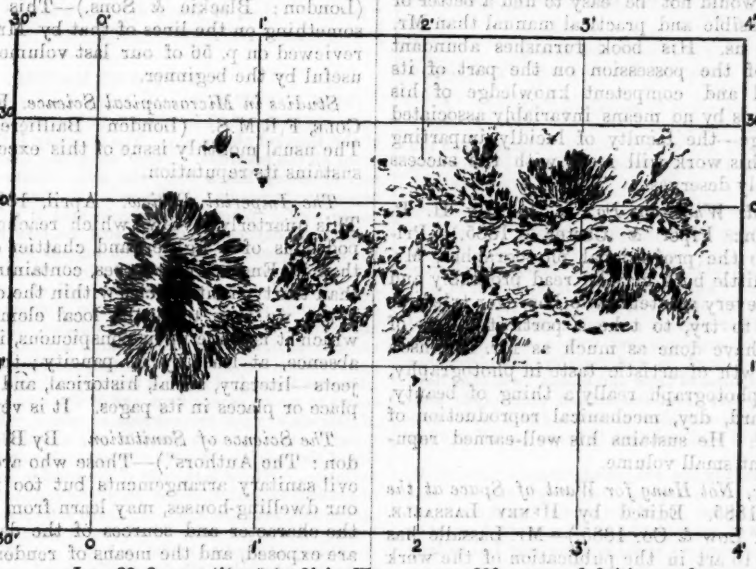
THE GREAT SUN-SPOT.

[1798]—I must apologise for troubling you again, but the magnificent display of solar activity shown in this splendid group is worthy of notice in KNOWLEDGE.



June 20, 8 a.m. Aperture, 3½ in. Wray; power 220; screen definition good.

Appearing on the limb on the 15th, unfavourable weather has prevented us from seeing it again until to-day (June 20).

Certainly we have had nothing like it as a display of force since 1883. The leading spot measures about 1′ 15″ on the disc, while the group in extreme length is about 3′ 40″.

Observing it with a direct eye-piece, the sight is really fine. The whole seems connected, and one common movement appears to pervade the different masses. At times of superior definition a great part of the penumbra seemed honeycombed with dark markings. I enclose a correct copy of a careful drawing done at the screen.

G. L. BROWN.

THE OLDEST SOLAR MYTH.

[1799]—In letter (1779) I said I believed the flaming sword of Eden to be a tradition of a real occurrence. If any curiosity be felt, I will explain.

In 1880 I wrote an essay (unpublished) arguing that the real Eden must have been at the north pole; at the pole, because the globe would there first be cool enough for life; at the north, because in the south pole's summer the earth is in perihelion*, so that it would remain hot after the north one. It has been replied that in those very remote times other conditions obtained, owing to the different ellipticity of our orbit; but a letter in *K.* last spring shewed that no trustworthy calculations exist as to this, since the discovery of Neptune vitiated all the previous ones.† I think two things may lead to conclude that the north pole was the first; (a) the fact that Torres Straits divide the southern from the northern fauna, as if the northern had had a longer run; (b) that man has become most civilised north of the equator.

Three or four books have since advanced this theory; one was noticed in *K*, but I have not seen any of them.

If the hypothesis is admitted, it is clear that life began, and continued for very long, under conditions wholly different from any with which we are familiar, or indeed which exist on earth now. All living things must have been confined to a roughly circular patch round the pole, widening as the earth cooled. The heavenly bodies were entirely invisible; a dense cap of cloud hung over the world, containing great part of our actual oceans. There would be a constant hot wind from the south. In fact, a Russian bath must have been our primeval climate. During the six months' day there was a dim light, equal perhaps to that of a London station in a fog. During the six months' night there would be impenetrable darkness, except perhaps for a few days before and after full moon.

Are there any data whence we can guess whether man already existed under those conditions? I think there are.

1. It seems improbable that man would hybernate, with his active brain. Darkness alone would not cause him to do so, for the mole, who lives always in the dark, is obliged to get up every four hours and make a hearty meal, otherwise he would die of starvation. But if man did stir at all during his long night, he would certainly be most alive and active for all objects at the four or five half-light periods of, say, eight days about the full moon. May not this be a more probable origin for certain periodical animal functions than the only one Darwin could imagine? viz., the covering of an ascidian at spring-tides (which would surely rather tend to establish a *fortnightly* period?) And this excitement by salt-water would not account for its absence in the intermediate phases of development. A definite period once established would not coincide with the *full* moon in every individual; any more than diurnal periods, as to which, *e.g.*, we see all men eat every day, but not all in appetite at the same hour. The full moon, however, does more or less trouble both men and other living things—*e.g.*, dogs—in a greater degree than the mere light explains. In Central America there are individuals who are "no good" except on moonlight nights, exceeding, then, in aptitude for the chase, &c., all others' *daylight* doings.

2. There is a universal tradition of a golden age—"*Saturnia*

* At present; 12,000 years ago precisely the opposite condition of things obtained.—ED.

† This must be taken *cum magno grano salis*.—ED.

regna"—when things were wholly different. Given that man started from a savage state, how can this be accounted for, if his conditions were the same as with savages now?

3. When the present state of things were about, the earth would be found less fertile, and life harder. The cloud-cap gone, and the easy Paradise gone, for the first time men saw the sun. It must have no doubt hurt their eyes very much at first. What more likely explanation than this for the flaming sword which *turned every way*—as the solar beams do—and was at the *east* end of the garden—where the sun rises? The record seems a strange one, if it cannot be explained naturally; for it would have seemed more natural to a primitive narrator to set lions or other beasts to guard the forbidden ground; which *we* know is not on earth at all.

Space forbids to pursue this theme further; but I suggest that physicists, if they keep it in mind, may perchance find it explain facts in natural history hitherto obscure. HALLYARDS.

THE MATHEMATICAL THEORY OF EVOLUTION.

[1800]—"Commentator," in referring to my theory of evolution, has unfortunately quoted a misprint from the brief extract given of it, under the above heading (p. 486)—*proposition* should have been printed proportion. The editor will therefore perhaps kindly allow me to restate the several positions, and to allow the printer to use capital letters and italics where I have used them:—

1.—*Adaptation to Purpose, Fitness*, resolves itself into *Adaptation of Proportion to Purpose.*

2.—*Evolution, Development*, into *The Becoming of the Proportioned in All Things.*

3.—*Politics*, into *The Proportioned Adjustment of Material Interests, and of Social Relations.*

4.—*Ethics*, into *The Science of Proportioned Conduct.*

5.—*Hygiene*, into *The Science of Proportioned Living.*

6.—*Education*, into *The Science of Training and Developing a Proportioned or Beautiful Race.*

7.—*Æsthetics*, into *The Science of Proportioned Taste.*

8.—*Fine Art*, into *Proportioned Art.*

Pending the publication of my work I cannot enlarge upon the subject, but I may say that the Mathematical Theory of Evolution is convincingly *optimistic.* W. CAVE THOMAS.

THE NATURE OF CONSCIOUSNESS.

[1801]—C. N.'s ideas (1761) are gradually becoming clearer. Her former admission that "*something* exists independent of consciousness," carries with it, of course, the fact of this "something's" externality, and her present admission that "every valid concept must certainly be correspondent with a thing," defines exactly what that "something" is, and therefore completes her surrender. My "vulgar realism of tripe and onions" will thus have had the effect of leading her from the refined philosophic tomfooleries of Lewinsianism to a higher, a nobler, and a wider conception of the relationship that subsists between herself and her surroundings.

If she will ponder carefully the subjoined extracts from G. H. Lewes, it will help her to overcome the misgivings she still evidently feels, as shown by her use of the terms "valid concept" and "group or synthesis of sensation"; as if a *concept* could be non-valid, or a *group of sensations* could in some way fail to fully represent the things so grouped.

In his "Problems of Life and Mind," Vol. II., pages 43–45, G. H. Lewes writes:—

When "an insight into psychological processes teaches us that knowledge is a process of two factors, the organism and the medium, the knowing mind and the object known, we come round to the starting-point, and still say that to know a thing as it *appears*, is to know it as it *is*, under the objective and subjective conditions of its appearence.

"A thing being a group of relations, varies under varying conditions. Obviously this changing group will not be the same throughout the changes, but it is here and there precisely what it appears here and there—the manifestation changes with the conditions.

"The famous distinction, therefore, between is and appears is either a logical artifice or a speculative illusion. The logical artifice points to the distinction between general relations and particular relations. The speculative illusion assumes that the knowledge of things being only of appearances, can never be a knowledge of things as they are in their inmost nature.

"Our utter inability to form a conception of the aspects which known objects would form to a new sense, ought long ago to have shown the inanity of speculating about the aspects of things in relations not sensible, and ought to have closed for ever the disputes about the supra-sensible. The logical distinction between the inward essence and the outward appearance is simply this:—The Thing considered outwardly—*i.e.*, in its presentation to sense, is the Thing in definite relations; but, besides this, we conceive the Thing as *capable* of other relations which are not definitely specified, or as existing in indeterminately fluctuating relations—*a mere possibility of appearance*," which possibility of appearance has—as is proved above—*to us*, no possibility whatever."

J. S.

VITAL FORCE.

[1802]—"Meter" (Letter 1759) almost piteously appeals to us not to seek to destroy people's reverence, not to rob the world of hope, &c., which alone affords any valid reason against a man doing just as he chooses. I would briefly console him. Men cannot "do just what they choose." If there was no reverence, no hope, no fear in the world, there would still be "necessity:" the inexorable laws of cause and effect, actions, and inevitable consequences. The first law of nature is "self preservation;" from it spring all notions of right and wrong, the golden rule, Do ye unto others as ye would be done by, for what you consider it wrong for others to do to you, it must be wrong for you to do to them.

F. W. H.

P.S.—I would further impress on "Meter" that knowledge is superior and, in fact, supersedes "belief." Teach people that, As thou sowest, so shalt thou reap; that evil actions produce evil consequences; that "sins" cannot be forgiven; that wrong done to ourselves or to others must be suffered for; that the laws of nature cannot be transgressed with impunity; that experience proves to demonstration, that on our "actions," not on our "beliefs," hopes, or fears, depends whether we shall be happy, contented, and prosperous in our present life, here and now.

MIND AND MATTER.

[1803]—"F. W. H." really does not seem to understand the difficulty some of us find in accepting, just as they stand, the axioms of the Haeckel philosophy. The difficulty I, for one, find is this: I grant all the premises. Every atom has a soul. Every combination of atoms has a composite soul, whether the combination is organic or inorganic. Every molecule of carbonic acid has its composite soul. When the carbonic acid is split up, each atom of carbon and oxygen can call its soul its own again. So each plant has its composite soul, and each animal too. So far, all is plain sailing; but now comes the difficulty. Man has a composite soul exactly similar to the composite soul of carbonic acid, a plant, or a dumb animal. Two of the attributes of a man's soul are said to be consciousness and volition. Therefore, the souls of carbonic-acid, a plant, and a dumb animal possess consciousness and volition, or man is the only combination of atoms which possesses them, just as he is the only animal that can speak. There seems to me no escape from one of the horns of this dilemma. One of Darwin's main propositions to which "F. W. H." refers indirectly—namely, that the life of the individual is a type of the life of the species—is perfectly untenable on the theory of gradual evolution. Where in the life of the species, according to the theory of gradual evolution, is the jump the individual makes on his first appearance into the light. If there is a corresponding jump in the history of every species of placental mammals, what becomes of the theory of gradual evolution?

Again, admitting all Haeckel's premises about matter having a soul, what is there to prevent the composite soul of the solar system having the same control over the matter of the system that a man's has over his body? Suppose the sun uses the force of gravity towards the planets because he likes them, and so cannot help using it towards comets (just as when a man beckons to three people he attracts them all when he only wants one), nevertheless, lets the comets know he does not want *them* by blowing them all to pieces. What a delightful solution to the much-contested problem of the cause of comets' tails! On the other hand, why should man, if Haeckel's doctrine of universal law be correct, be the only combination of matter which is able to change its mind?

Of course, it is more satisfactory to explain phenomena in a simple natural way than to have recourse to a supernatural miraculous way. But, when Sir Charles Lyell wrote his "Principles of Geology," the book that made Darwinism possible, it was the custom to explain every geological phenomenon by a cataclysm, or an earthquake, or a flood; nevertheless, Sir Charles himself pointed out that when the crust of the earth was thinner, earthquakes and volcanic eruptions produced very different effects to what they do now. Each philosopher in turn calls his the simple natural way. None ever dreams there is more in heaven and earth than in his philosophy. JOS. W. ALEXANDER.

INFINITE DIVISIBILITY.

[1804]—Does not the difficulty concerning infinite divisibility arise from the confounding of two separate questions, of which the one is concerned with natural history or physics, and the other with either formal logic or metaphysics?

The question whether or not there is a limit to the divisibility of matter is surely a question of physics. Matter may be composed of small portions capable of resisting the disintegrating action of any natural process whatever. These portions will then be, physically speaking, indivisible; and we must then say that there *is* a limit to the divisibility of matter.

Whether or not this is the characteristic of matter is a question of science, and must be settled, if settled at all, not by any intuitive intellectual effort, but by actual experiment.

The other question is not a physical but a metaphysical question. In this sense, "infinite divisibility" is no longer concerned with the divisibility of any substance by any force, but is concerned with the divisibility of a mental abstraction, and, therefore, has no more to do with the divisibility of an atom of matter than the triangles and circles of the geometer have to do with those of the brassfounder.

If these considerations are applied to the example given by "Hallyards" (1747) of the disk and its centre, it will be clear, I think, that the difficulty does arise from the confusion to which I have referred.

The disk of which he speaks and thinks is a piece of metal, cardboard, or other substance; but the centre of which he speaks and thinks is the geometrical centre of a geometrical circle, and not a material atom.

Descartes rightly taught that one of the requisite precautions for the discovery of truth is to divide a complex question into its components. Let us, therefore, begin by separating the empirical question as to the structure of matter from the metempirical questions of ideal geometry.

I believe this problem has been discussed by Mr. G. H. Lewes in "Problems of Life and Mind," and also by Prof. Clifford in one of his published "Lectures and Essays"; but I have not the books to refer to. M. B.

GRAVITATION.

[1805]—"No two gases of different composition can remain in contact with each other without mutually intermingling or diffusing themselves through each other. . . . . But for this diffusion, and the fact that it overpowers gravitation, we could not live upon the earth."—KNOWLEDGE, p. 539.

May I not claim this as another influence counteracting gravitation as a *universal* law? By it, carbonic acid gas *should* always be lowest; which in practice it is not; yet no chemical mixture prevents its obeying the law. HALLYARDS.

A OR AN?

[1806]—I agree with your correspondent, Mr. E. A. Phipson, in disliking the use of the article "an" before an aspirated "h." But will he permit me to remind him that it is hardly correct to describe the practice as "the present fashionable affectation"? If he will take the trouble to look at Browne's "Vulgar Errors," Book v., chapter 21, he will find the following sentence:—"If *an* hare cross the highway, there are few above threescore that are not perplexed thereat." So in Proverbs, chap. xi., v. 9, we read—"*An* hypocrite with his mouth destroyeth his neighbour." Again, in St. Matthew," chap. xvii., v. 1, we find the expression—"*an* high mountain apart"; and I am sure that thousands of instances might be culled from the best sources of "English undefiled," to show that the usage which Mr. Phipson stigmatises as modern is, if the hyperbole may be pardoned, "as old as the hills."

PHILIP KENT.

EYEBROWS.

[1807]—I should be glad if any reader of KNOWLEDGE would give me information on the following points:—Are eyebrows supposed to have developed as a protection for the eye—those subjects who had the more hairs having had their eyes better protected, and therefore (other things being equal) survived as the fittest; or are they the result of natural selection for beauty's sake? If the latter, how is it that the Northern Chinese are almost wholly without them? I have it on a Chinaman's authority that eyebrows are considered by the natives to add beauty to the face (and, for all I can find to the contrary, their ancestors must have thought likewise), and yet nine out of every ten one meets in the streets have hardly any whatever. Or, lastly, supposing eyebrows to be the remains of hair which once covered the whole forehead, are we to consider the Chinaman as in a more advanced state of evolution than we "foreign barbarians," and to believe that the inexorable law of Progress will compel us to follow in his "celestial" footsteps? One feels inclined to say, "God forbid." E. T. C. W.

Peking.

DISINTEGRATION OF THE WEALDEN SANDSTONE.

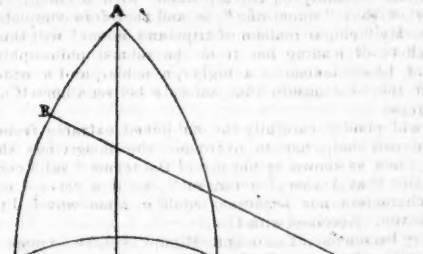
[1808]—A correspondent (letter 1779), in alluding to certain markings on rocks at Tunbridge Wells, uses these words: "They must have been abraded in almost historic times." This sandstone formation, like all the Wealden strata, is a fresh-water deposit, composed of quartz, more or less comminuted, and fine clay (loam) in varying proportions, held together by a solution of iron. It is not affected by frost, but the solvent power of rain-water in time finds out its softer parts, and washes them away, leaving the harder or insoluble parts standing up in relief as irregular ridges, hence the honeycomb markings, or pits, to which your correspondent alludes.

The time required to produce this honeycombing under the ordinary condition of the rock is, I think, far longer than the three thousand years or so constituting the historic period. I have formed this opinion on the following grounds, made from personal observation.

Trinity Church, Tunbridge Wells, was built about sixty years ago of this stone, dug from quarries within a mile of it; the church is unprotected from the south and west, yet the tool-markings upon the stones are as sharp and well-defined as if made yesterday. The oldest squared-stone erections that I know built of it date from about 1350; take Bodiam Castle and Etchingham Church as examples; they show little or no sign of weather wearing, and the scanty tool-marks of the workmen, made more than 500 years, are still visible. The present appearance of this stratum, exposed as rocks and cliffs at Tunbridge Wells and in East Sussex generally, is due to two causes, the primary one being the enormous denudation which followed in comparatively recent geological times its upheaval from great depths, the second and chief cause being subaërial denudation. The cracks and crevices, from the fraction of an inch in width to any number of feet, are due entirely to its elevations with all the Tertiary deposits upon it. These have all been denuded, except a bit or two on the south coast. The town of Seaford is built on one of the remnants of the Tertiaries; the horizontal sandstone-floor could not stand the pressure upwards without breaking, hence these fractures. JOHN SHARP.

FORM OF THE HEADS OF PROJECTILES.

[1809]—Captain Martin, (late) R.N., sends the following for solution:—



Let A, B, B′ be an ogive or solid of least resistance in a resisting medium, described by the revolution of the arc A B about its semichord A P. It is required to find what the length of the radius O R should be in order that a solid whose volume should be the greatest possible, whilst its surface should be the least possible, should be described.

My solution makes R = 4·426, B′P B = d

The value to satisfy these two conditions.

FECUNDITY OF NATURE.

[1810]—Miss C. F. Gordon Cumming relates (in the *Pall Mall*) that in 1883 there were killed in Cyprus no less than *two hundred thousand millions* of locusts. Immense efforts, and about £60,000, (in four years) were necessary. Am I not justified in suspecting that on our planet survival is easier than extinction?

When I was a child, I set myself to clear a garden of slugs. I

killed from two to three hundred every evening of the season, during three years; the fourth summer there was hardly a slug to to be found. HALLYARDS.

PRINTERS' DEVILRY.

[1811]—KNOWLEDGE has always had, I think, an excessive amount of errata and mistakes;* but I must confess that the *Saturday* runs you hard sometimes. Thus, May 30, the *S. R.* has "whether Bacon's soul went to *Arthur's bosom* (where it would in some of its moods have got on excellently with another inmate)" . . . and below—"during his sojourn in *Arthur's bosom*." Now, I cannot imagine how any being able enough to have developed type as his "protective peculiarity" could fail to see by the allusion to Lazarus—whom he must have heard of at church, if nowhere else—that, if even his copy had had but "A——," there could be no hesitation in filling up. "Brehon" laws of course appears as "Breton" in the same journal; and I suppose no one ever got "patristic" in a first revise. However, it is not always subordinates who are preternaturally obtuse. "As to this I confess I am *tomdidemus*" (in an old letter). Can there be a doubt as to what this means? Yet the reviewer declared it insoluble. A confrère flashed the levin of scorn on a hapless novelist for having a "Bp. of ——shire;" declaring no *district* ever to give title to a see; in face of Man, Galloway, Argyll, the Isles, Meath, Ossory, &c.

Considering how many broken-down scholars there are "around" living on their wits, (which must be good, or else they would starve) it seems strange they cannot be *cast* as press-correctors, where they would be "the right men in the right places."

HALLYARDS.

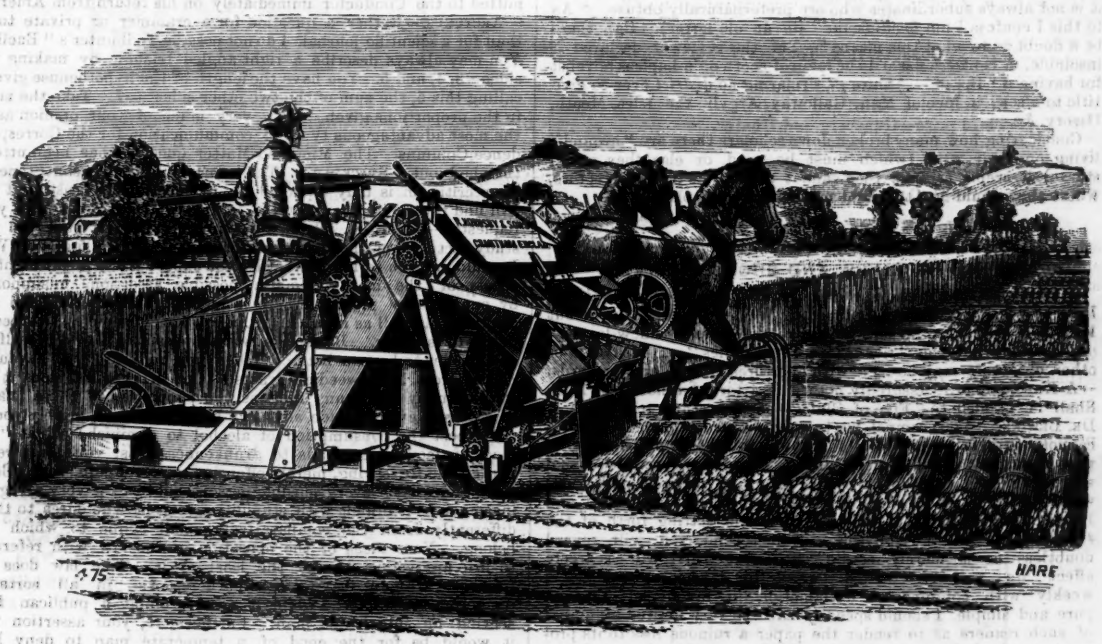
LETTERS RECEIVED AND SHORT ANSWERS.

J. WEBB. I do not know who the London agent for the *Sidereal Messenger* is. Try Grevel, Trübner, or Wesley & Son. No one but Mr. Nasmyth has, so far as I am aware, ever seen "willow-leaves" on the sun, but the "rice-grains," "granules," or "leaves" of other observers may be seen with apertures of 6 in. and upwards. —A KREOPHAGIST. Assuredly not; it is utterly baseless.—J. L. P. Shall be handed to "Five of Clubs" on his return to London.—DR. LEWINS. You compel me to speak plainly. Briefly, then, I cannot convert the columns of KNOWLEDGE into a propaganda of your doctrines for two simple reasons. The first is that this journal was established for the purpose of affording efficient and trustworthy instruction in what is proved and *known* in Natural and Physical Science, and by no means for the setting forth of the subtilizations of Metaphysics. The second you will regard doubtless as a merely sordid one; but this will scarcely affect its validity. If I were to favour my readers weekly with columns of declamation in favour of Atheism pure and simple, I should speedily have so very limited a number of such readers as to render the paper a ruinous loss to its proprietors, which I could assuredly plead no justification for doing. This is why I suggested to you to start an organ of your own. Surely, as sporting men say, "you ought to back your own opinions."—W. CAVE THOMAS. He lives in Italy. If I can ascertain his address accurately, I will forward it.—D. WALKINSHAW sends a new system of spelling, which surpasses all the systems of phonetics that I have, so far, seen in simplicity. It contains no new characters nor letters. Try the Philological Society.—J. FOULERTON. Received with thanks.—H. A. BULLEY. The discussion is a very barren one. You only meet your opponent's dogmatic assertions with others equally dogmatic, and, let me add, equally unprovable.—COMMENTATOR. Please send your exact address, as there is a letter lying here for you.—W. SOUTHWICK ROGERS. In its existing stage it is simply a commercial speculation which I certainly do not feel called upon to advertise gratis. — JOHN HAMPDEN. Don't talk nonsense! The gnomonic projection of the circles of the sphere upon the plane of the terrestrial equator was employed ages before either you or I were born or thought of. The southern (outside) part of your map is wildly wrong!—COMMENTATOR. *Requiescat in pace.* Observe what factitious importance such a discussion confers on the subject of it.—JAS. S. GREIG. I shall be happy to accept it as a voluntary contribution. Should you not agree to this, I will return your MS. on receipt of a properly-addressed and sufficiently-stamped envelope. The conductor is in the United States. — HALLYARDS. All safe to hand, and will appear in instalments. The *précis* was not set up after what you said, your remonstrance reaching me in time for me to stop it.—M. B. The actual superior limit of the atmosphere is supposed to be about 200 miles above the earth's surface. This estimate is derived from the observations of twilight by M. Liais, in Rio Janeiro. I know nothing of Faraday's experiments establishing the limit of diffusibility of mercury. Your concluding problem is insoluble without more data than we possess at present.—J. H. COBBETT. The image of any given star—Sirius, Aldebaran, or what not—formed by the object-glass of the telescope, is thrown on to the slit of the spectroscope, so that we of course know what object it is that we are examining spectroscopically. Light travels in straight lines, so that no other rays can reach the eye than those from the object under observation. Light passing *across* the field of view is absolutely invisible (see Vol. V., p. 306). Do you not see that if the light of the different stars traversed the immaterial population you postulate, it would render the stellar spectra all alike—or at all events they would have a vast amount in common. But for the kind of discussion it would provoke, I should print your very amusing letter *in extenso*.—R.A.H. Shall be submitted to the Conductor immediately on his return from America. —ARCTURUS.—Rather a question for a crammer or private tutor than for a scientific journal. I do not possess Todhunter's "Euclid." You may always describe a right-angled triangle by making the sides = 3, 4, and 5. You have the length of the hypothenuse given; calling this 5, the sum of the two other sides = 7. Take the sides in the proportions given. I am very much of your opinion as to the most advantageous types of communication for the Correspondence Columns. The Mind-and-Matter question has been utterly thrashed out.—STACKYARD. The courtesy and pleasant tone of your criticism is only equalled by its candour. I trust that you will find future numbers altered in precise compliance with your requests.—W. M. K. With a preliminary request that you will study section 3 of the concluding paragraph on p. 505 of Vol. VII., I would ask you seriously whether you expect me to insert eighteen sheets of the most dogmatic possible assertion, unsupported by one atom of proof? There is intemperance in language and argument as well as in drink. Alcohol does mischief. Granted.—but so does water. Because a woman uses it to drown herself in, am I never to have a bath? When you reiterate that favourite phrase from Mr. Tweedie's tracts, "Our drink bill," does it not strike you by how many millions the population of these islands increases in every decade, as shown by the census? Surely you do not expect the consumption of alcohol to diminish! That "the road of moderation leads to drunkenness" is, you must really pardon me for saying, merely offensive cant. Again, your allegation as to what "every sensible person believes" is very arrogant, inasmuch as it brands with stupidity everyone who dares to think differently from the comparatively small clique to which you belong. Your ideas of the operation of the law with reference to fire are vague, to say the least of it. The law does not prevent a man having gas-burners, &c., in all sorts of dangerous positions; while it does prohibit a publican from serving an intoxicated man. Furthermore, your assertion that it would be for the good of a temperate man to deny himself any stimulant whatever is simply the expression of your opinion. Thousands of the best and wisest men who have ever lived have thought differently. Yes, I can say that, living artificially as we do, strong drink is a *very* "necessary article of consumption for proper nourishment of a man in ordinary health." When gentlemen wore nothing but a few dabs of woad on their persons, and ate acorns, spring water was obviously the most fitting beverage for so pig-like a diet. And here, again, you are guilty of making an assertion without a fragment of proof when you assert that "the leading men of the medical faculty" think total abstinence reasonable or wholesome. Why, I could fill this column with the names of the very greatest physicians and surgeons, all of whom not only recommend alcohol, (in strict moderation), but take it themselves. Your two questions are modest demands for me to prove a negative—which no one is called upon to do. The question as to the superior "vitality and endurance" of water-drinkers was tried out in the hayfield in an English county only last year, with the result that the beer-drinkers beat the brethren of the pump off their heads. As for your evidence of longevity, it is worthless. A vast proportion of the oldest men whose deaths have been recorded have been both moderate drinkers and smokers. And can you give me the name of one single insurance office which takes teetotalers' lives at a lower premium? To be brief, your tremendous letter consists of assertion from beginning to end. My first impulse was to print it *in extenso*, and let the reviewer of the book which evoked it reply to you. In mercy to you, though, I have done so myself. From the days of Noah downwards men have taken wine, and will continue to take it, the United Kingdom Alliance notwithstanding.—M. HUMM. Lectures will be duly announced.—GEOLOGISTS' ASSOCIATION. Received.

* [How many of these have their origin in the detestably bad writing of people to whom it is impossible to send proofs?—ED.]

Our Inventors' Column.

We give here, week by week, a terse description of such of the many inventions as we think may be of use to our readers. Where it is possible, the number of the patent is quoted, to enable those who desire fuller information to procure the specification from the Patent Office in Cursitor-street, Chancery-lane. We shall, generally speaking, confine ourselves to the more recent inventions; but it often happens that an article comes under our notice which, although not quite novel, is worthy of mention for its utility and ingenuity. In such a case we should not hesitate to refer our readers to it. And while we thus increase the interest of our pages, we at the same time assist the inventors by giving greater publicity to their inventions (KNOWLEDGE *being a popular magazine*) *than is accorded by the most excellent trade journals.*

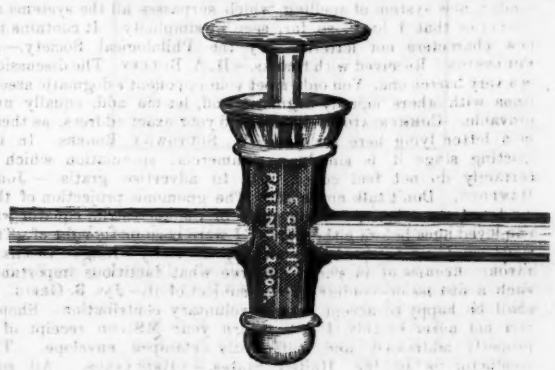


CRADLE FOR HARVESTERS.

[Patent No. 10,908. 1884.]—This is a new Sheaf-carrier, by Messrs. R. Hornsby & Sons, Limited, of Grantham, applied to their sheaf-binding harvester, for gently delivering the sheaves upon the ground in lots of three, four, or five at a time, in windrows, as well as for always carrying the sheaves round the corners of the plot, thereby preventing the possibility of the corn being trodden upon by the horses. This novel arrangement was first introduced at the binder trials of the Royal Agricultural Society at Shrewsbury, in August last, where it was tested, and pronounced by all to be the most perfect ever produced. The sheaf-carrier consists of a cradle made in two parts, and opening in the centre, one part being hinged underneath the binding apparatus where the sheaves are dropped, and the other carried by supports projecting from the machine, and hinged thereon. The part nearest the binder is made of a single board, mounted on an iron support, jointed close underneath the binding table. The outer bar consists of a wooden board supported at each end, and carrying four steel prongs, the extreme ends of which meet the edge of the board about the middle of the cradle. The two halves of the cradle are coupled and controlled by a rod. Both these parts are held in position by the driver's foot until a sufficient number of sheaves (three, four, or five) have been received from the binder into the cradle, when he lifts his foot, allowing the weight of the sheaves to open the cradle in the centre, the board falling towards the machine and the prongs outward, the sheaves falling gently to the ground, and being, by the opening action of the cradle, spread on the ground side by side, and in no case one upon another, as is done by other forms of sheaf-carriers. As the machine travels forward, the open cradle passes clear of the sheaves, and is again closed in position to receive further sheaves by the pressure of the driver's foot. In cases where the cut crop is not required to be tied into sheaves, by not putting any string in the binder, the sheaves are ejected loose into the carrier, and deposited in heaps or windrows at any distance desirable for the convenience of loading in accordance with the size of the crop. The advantage of this patented invention is that it enables the driver to absolutely control the delivery of the sheaves, carrying three, four, or five at a time, and placing them in windrows, as well as by always carrying forward the sheaves at the corner of the plot, to secure one or more clear roads out from the centre of the field. The machine works equally well on hilly or on level ground.

THE VACUMOTER.

THIS invention, introduced by Mr. Cetti, 36, Brooke-street, Holborn, E.C., is one which is likely to prove highly useful to physicists. It consists of a glass tube, provided with a tap, having a sealed bottom, while the stop-cock itself is furnished with a receiving cup in which is placed glycerine or some other liquid,



which, adhering to the glass, prevents the ingress of air, and thereby enables the experimentalist to obtain something more nearly approaching a perfect vacuum than could be hoped for with the ordinary glass stop-cock, be it ever so well made. The simplicity of this patented tap is not the least of its recommendations.

Our Chess Column.

By Mephisto.

BRITISH CHESS ASSOCIATION.

FRIDAY last the proceedings of the British Chess Association were brought to a close. An adjourned game between Bird and Guest was declared drawn. This ended the Tournament, the winners of which are:—

First prize	.....	J. Gunsberg	Score 14
Second „ }	.....	H. E. Bird.....	„ 12
Third „ }	.....	A. Guest	„ 12
who divide the two prizes.			
Fourth „	.....	W. Pollock.....	„ 10½
Fifth „ }	.....	G. A. MacDonnell.....	„ 10
„ „ }	.....	R. Loman	„ 10
who divide.			

Consultation Tourney.

First prize—Mason and Donnisthorpe.
Second prize—Bird and Hewitt.
Third prize—Gunsberg and Hunter.

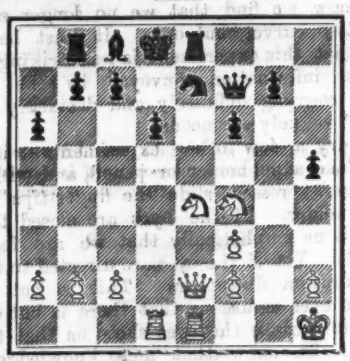
Final score in the B. C. A. Tournament:—

	Won.	Lost.	Drawn.		Won.	Lost.	Drawn.
Bird	10	1	4	Loman	9	4	2
Donnisthorpe	8	7	—	Mackeson ..	—	14	1
Gunsberg ...	13	—	2	Pollock	10	4	1
Guest	11	2	2	Rabson	1	13	1
Hewitt	6	7	2	Reeves	5	8	2
Mills	4	8	3	De Soyers...	3	10	2
MacDonnell .	9	4	2	Wainwright.	8	5	3
Mortimer ...	5	8	2	Rumboll ...	4	11	0

Position in the last game played in the Tournament between Messrs. Guest and MacDonnell.

G. A. MacDonnell.

Black.



White.

A. Guest.

White won the game by the following masterly line of play:—

1. R × P (ch)!	B to Q2

White's move is as effective as it is brilliant. If Black plays P × R White obtains an advantage by 2. Kt × P, Q to Kt sq. 3. Kt × R, Q × Kt, 4. Kt to Q5, &c.

2. Kt to K6 (ch)	K to B sq.
3. Kt (K6) to B5	B to Kt4
4. Q to Q2	B to B3

Here Kt to B4 would have been better.

5. R to Q sq.	Kt to Q4

If Q to Kt sq., White wins by R × B, threatening mate.

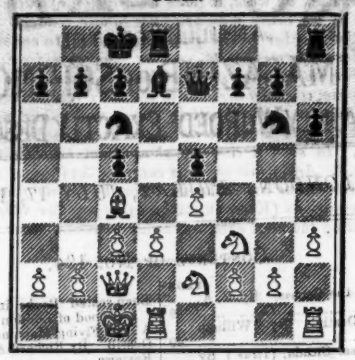
6. R × Kt	B × R
7. Q × B	Q × Q

8. R × Q and White won.

The following position occurred in a game between Messrs. Guest and Gunsberg:—

J. Gunsberg.

Black.



White.

A. Guest.

Black continued as follows:—

B to Kt3	Kt to R4
Kt to Kt3	B to B3
	Kt to B5

Anticipating White's intention to play Kt to B5 and P to Kt3, Black prepares a surprise.

Kt to B5	Q to B3
P to Kt3	R × P!

A deeply-involved sacrifice, which leads to many complicated variations, very difficult indeed to examine in actual play, with a time limit of twenty moves an hour.

R × R	B × P!

A necessary sequal to the former move. Besides the actual line of play—Kt to Q7 (ch)—adopted by White in this highly interesting position, he has two other moves at his disposal, both of which, we think, however, should lead to a slight advantage of Black, as the following variations will show:

(a)		(b)	
P × Kt	Q × Kt	R to Q8 (ch)	R × R
Kt × P (a)	P to B5	Q × B	Kt to Q6 (ch)
	and wins	K to Kt sq.	Kt × BP
(a) Kt to R4	Q × P (ch)	Q to B2	Kt × R
Q to Q2	Kt × B (ch)	P to Kt4	P to KKt3
P × Kt	B × R	Kt to R4	P to K5
	and wins		and wins

There are many other possible moves both for White and Black, from all of which, however, Black should emerge with a good game. White continued:—

Kt to Q7 (ch)	Q × Kt
P × Kt	P to B5
R to Q8 (ch)	R × R
Q × B	P × B
P × P	Kt × P (ch)

Remaining with a Pawn move for the End-game.

INTERNATIONAL TOURNAMENT AT HAMBURG.

The bi-annual meeting of the German Chess Association will take place at Hamburg, and begin on the 12th inst. According to reports received, the entries are numerous, and comprise most of the best players in Europe. Liberal prizes have been offered, and it is expected that more than the average number of competitors, on such occasions, will this year journey to Hamburg. Of English players Messrs. Bird, Blackburne, Gunsburg, and Mason have entered their names. Captain Mackenzie, of New York, is also expected at Hamburg.

Mr. R. A. Proctor's Lecture Tour.

1885–6.

Subjects:

1. LIFE OF WORLDS
2. THE SUN
3. THE MOON
4. THE PLANETS
5. COMETS AND METEORS
6. THE STAR DEPTHS

Arrangements are now being made for the delivery of Lectures by Mr. Proctor from August onwards. Communications respecting terms and vacant dates should be addressed to the Manager of the Tours, Mr. John Stuart, Royal Concert Hall, St. Leonards-on-Sea.